THE AMERICAN GAS LIGHT JOURNAL

ROMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXV. No. 3. Whole No. 1,362. | NEW YORK, MONDAY, JULY 15, 1901. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

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[OFFICIAL NOTICE.]

Ninth Annual Meeting, Pacific Coast Gas Association.

OFFICE OF THE SECRETARY,
415 POST STREET,
SAN FRANCISCO, CAL.,
June 5th, 1901.

To the Members of the Pacific Coast Gas Association: The Ninth Annual Meeting of the Pacific Coast Gas Association will be held at the offices of the San Francisco Gas and Electric Company, 415 Post street, San Francisco, Cal., Tuesday, Wednesday and Thursday, July 16, 17 and 18, 1901.

The technical programme calls for the following:

"President's Address;" by Mr. John A. Britton, Oakland, Cal.

"Report on International Congress of the Gas Industry, Paris, 1900;" by Mr. J. B. Grimwood, San Francisco, Cal.

"Distribution of Alternating Currents;" by Mr. George C. Holberton, Oakland, Cal.

"Promotion of Domestic Fuel Gas Consumption;" by Mr. R. P. Valentine, Sacramento, Cal.

"Practical Power Transmission;" by Mr. John Martin, San Francisco, Cal.

"Experience with Carburetted Water Gas Sets;" by Mr. A. C. Beck, Oakland, Cal.

"Practical Testing of Oils for Gas and Fuel Purposes;" by Mr. L. P. Lowe, San Francisco, Cal.

"Gas Engines," by Mr. W. J. Casey, San Francisco, Cal.

It is urgently requested that members interest themselves in the "Wrinkle" and "Experience" departments, and that their communications thereon be forwarded without delay to the respective Editors thereof: Mr. George H. Hollidge, Merced, Cal.; and Mr. O. M. Gregory, San Jose, Cal.

Both named departments offer unlimited opportunities for the advancement of our common interests; but the measure of success is entirely dependent upon the efforts of the individual members. Let everyone contribute liberally.

Those who have questions to propound are reminded that the same should be forwarded to the Secretary in good season, in order that the "Question Box" should be filled with interesting matter for discussion by the members.

The Secretary announces that his services are at the ready disposal of the members, and that all communications or requests addressed to him will be promptly replied to or answered. He will be at headquarters prior to and during the meeting, and will be glad to render assistance, in the matter of securing hotel accommodations for those living at a distance, or in any other way whatsoever.

An informal meeting will be held at headquarters, Monday evening, July 15th, to which all are cordially invited.

A banquet will be served the evening of Wednesday, July 17th, and an outing has been arranged for the third day, Thursday, July 18th.

J. B. GRIMWOOD,
Secretary.

LIBRARY OF CONGRESS
JUL 15 1901

BRIEFLY TOLD.

DEATH OF MR. GEORGE B. NEAL.—With exceeding regret we sorrowfully report the death of Mr. George B. Neal, for almost half a century justly prominent in the gas affairs of New England, through his connection with the old Charlestown (Mass.) Gas Company and its successor, the Charlestown Gas and Electric Company, and from his sturdy and hardworking relations to and with the New England Association of Gas Engineers. His death occurred in the Massachusetts General Hospital, Boston, Mass., the afternoon of Sunday, July 7th, in which institution he had been operated on the previous week for a complicated case of chronic hernia. The funeral services were held at 3 P.M. of last Wednesday, in St. John's Episcopal Church, Charlestown, in the service of which, as member, organist, supporter, and finally Treasurer and Senior Warden, he labored faithfully and well for over two score years. The New England Association of Gas Engineers was notably represented at the ceremonies. In due time we will present an accurately prepared history of his long, useful and honorable career.

A DISTURBING SIGN.—In these times of piping tunes, all set to strains of peace and plenty, a note of discord occasionally obtrudes itself to mar somewhat the lulling effect of the harmony of plenty. From the point of view of the capitalist his work of the last year or two has been of the brightest and most successful sort; for has he not made two shares for transfer purpose where only one existed prior to his "readjustings." So it goes merrily on; or, so it has gone merrily on for the capitalist—say, since 1897, save a small break for ten-twelfths of the year prior to Mr. McKinley's re-election. But capital often overreaches itself, in that it does, especially towards the close of the "seven fat years," forget that it is after all largely dependent upon labor for its purchasing qualities. That would seem to be the case just now. From 1897 capital, which was waxing strong again after its lean experience of 1893 and later on, has perfected many a strong combination the result of which is that its rewards have been manifold. But meanwhile the workingman, remembering his own condition and that of his employer in 1893, when they both were tiding it over as best they might, is seemingly thinking that in the "flourishing conditions" of the present time, his employer does not permit him to fairly share. It does not require the consumption of much midnight oil to determine the fact that the immediate or nearest danger to the partial disruption of our "flourishing times" is that the workingman fears his employer is postponing too long the happy day when the former shall have something worth out of the latter's share of superabundance. The plain case is that a most disturbing sign of the times is the unrest of labor, the unruly manifestations of which are becoming too many and frequent that they may be scornfully overlooked.

NOTES.—It is the avowed intention of the capitalists who completed the consolidation of the gas, electric lighting and water supply interests of Charleston, West Va., to practically rebuild the gas works.——We understand that the Charlottetown Light and Power Company, of Charlottetown, Prince Edward Island, Canada, has purchased the local plant of the Royal Electric Company.——A gentleman from Little Rock, Ark., in the goodness of his heart, who is in Chicago, proposes to help out the residents of the Windy City through the medium of the following gaseous proposition: "If the city will furnish the pipes I will make satisfactory guarantee that I will turn into those pipes for distribution all the gas that is desired at not more than 25 cents a 1,000 cubic feet. If the city does not like the proposition then the Peoples Gas Light and Coke Company or other private corporations will have a chance. But I would like to see the city take this matter up." Mr. Hibbard has been "stopping" at the Grand Pacific house in Chicago for several days, but up to the time of writing neither the officials of Chicago nor the proprietors of the Peoples Gas Light and Coke Company have made arrangements with him. San Francisco is the place for Mr. Hibbard, for there in the last "few years" any old sort of gas scheme seems to go on; for a while, at least.——"Mr. E. B. Newhall has presented to the Common Council of Detroit a petition for the passage of an ordinance permitting him to establish and operate a gas plant in that city. The petitioner offers to furnish illuminating gas at 80 cents per 1,000 cubic feet, and illuminating gas for fuel purposes at 65 cents per 1,000 cubic feet. The ordinance will not pass." So writes a "Detroiter" who knows whereof he speaks, as a usual thing.——We have just received the news of the death of Mr. William Stacey, President of the Stacey Mfg. Company, of Cincinnati, O., whose demise occurred in that city, the 17th ult.

Self-Intensifying of Gas Pressure by Means of Waste Heat.

[A paper read by MR. C. SCOTT-SNELL, of London, at the meeting of the Incorporated Gas Institute.]

The necessity for means of attaining pressure in the lamp itself was recognized by the author soon after taking up the study of intensified gas lighting. The compressor system involved a plant or equipment, and, therefore, caused an initial outlay which necessarily limited its sphere of application.

The recognition of the want of such an invention was not any step in its solution; it was indeed already recognized by Lecomte, who placed a small water injector (supplied from the city mains) in each lamp post. On considering the selection of a force available to operate any intensifying appliance, waste heat was certainly obvious, and possessed the advantage of being free of cost; while neither drought nor frost would affect its efficiency. The utilization of the thermal force, however, involved great difficulties, if any of the most obvious methods were to be brought into operation. In no case could success be achieved if a motor driving a compressor was to be employed. The necessity for governing the speed and the pressure, the awkward accompaniment of a possible dead center, troubles with lubrication, vibration and many other obstacles arose, and reduced the question to a problem of a very difficult nature.

An appliance was required which should receive gas at normal pressure and deliver it at an increased pressure of 8 inches of water or more. (1) It must be operated by waste heat. (2) It must require no lubrication. (3) It must not have a dead center. (4) No flywheel, slide valves, connecting rods, packed glands, or friction producing appliances must be included. (5) It must be self-controlling. (6) Its cost must be low. (7) It must be simple in construction and easily adjusted. Such a programme of conditions and prohibitions seemed, at the first blush, to indicate that the problem could not be solved, except by some mystic appliance, such as the Keely motor, of American notoriety.

By a certain line of reasoning, however, it was decided that an invention using heat as a motive power was bound to include a displacer movement, as in every hot air engine; and where two different pressures of gas were necessarily involved (a low inlet pressure and a high outlet pressure, check valves were essential. It was easy to see that, by the movements of a displacer within a vessel heated at one end and cooled at the other, gas or air could be drawn in at one check valve and ejected at the other, provided some agency could be found to operate the displacer without involving the use of the prohibited appliances above mentioned.

Those to whom the present arrangement in the lamp for overcoming such a difficulty is known, may regard the solution of the problem as very simple; but the introduction of the diaphragm (responsive to the variations of pressure within the displacer chamber), and its direct attachment to the displacer, is not on the ordinary lines of hot air motor practice. Usually the displacer is operated in advance of the working piston, and involves certain secondary mechanism. It is difficult in designing to clear the mind of ordinary ideas of practice. The direct attachment of a displacer to a diaphragm—the weight of the displacer being taken by a spring—involves a curious condition of circumstances. It is natural to assume that heat being applied to the bottom of the vessel or container, expansion of the confined gas will take place (in pressure limited by the weight on the outlet valve, which will act as a safety valve as it were), and the responsive diaphragm will lift the displacer until all the gas collects below the displacer and against the hot lower plate. The displacer would then apparently be retained at the top of its stroke until the expansive action of the gas was exhausted and the pressure fell, thus allowing the displacer to come down again. This action, however, would be too slow for practical purposes, and, moreover, never does obtain in practice, as will be seen later on.

The conditions under which the apparatus operates are as follows. The vessel is charged with gas, one-half of which (the upper) is at a moderate temperature—say, 80° F.—the lower half being perhaps at 500° F. Now such a state may be quite consistent with perfect equilibrium of pressure throughout all the gas in the vessel. It may also be consistent with a flow of gas entering at the inlet valve, going across the chamber, proceeding through the outlet valve, and on to an incandescent burner or elsewhere. The condition of equilibrium under such circumstances is, however, very unstable; the slightest movement of the displacer, either up or down, would obviously lead to a transfer of cold gas to the hot side, or of heated gas to the cold side, as the case might be, and this would be followed instantly by contraction or expansion tending to produce a change of pressure in the chamber.

Diagram 1 shows a displacer chamber viewed as gas is going through, but no heat applied; the displacer movement, therefore, produces no effect on the gas. Diagram 2 shows the displacer at mid-stroke. Diagrams 3 and 4, with the notes appended, illustrate the conditions which

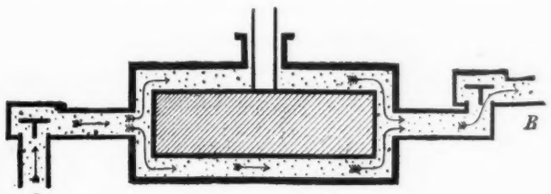


Diagram 1.—Showing displacer chamber with check valves, no heat applied, reciprocation of displacer has no effect on gas.

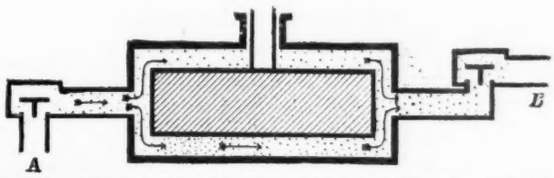


Diagram 2.—Showing displacer at half-stroke and heat applied to base of chamber. A film of cold gas passes over the top of displacer and a film of hot gas passes under the displacer, but the equilibrium of pressure is still maintained.

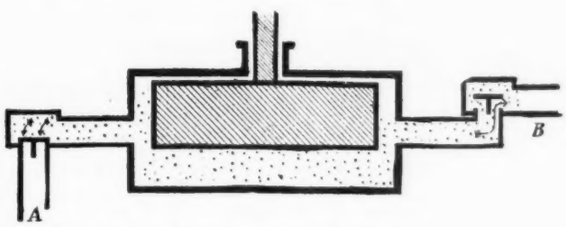


Diagram 3.—Displacer raised, gas transferred to hot section. Expansion closes valve *A*, and drives gas out at *B*.

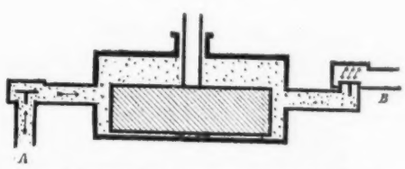


Diagram 4.—Displacer depressed, gas all transferred to cold section. Contraction causes partial vacuum, gas rushes in at *A*, while *B* is closed by back pressure.

follow movement after heat is applied. Diagram 5 illustrates essentially the conditions which obtain when a diaphragm is attached to the displacer rod and made responsive to the variations in pressure in the chamber. With this construction before us, the action may be readily followed. For clearness, let us assume the displacer to be slightly, yet quickly, lifted. It follows that a quantity of cold gas is added to the heated section and caused to expand. Such expansion stops the inflow from the gas supply, by reason of the rise of pressure acting on, and closing, the inlet valve; it also causes a blow-out through the outlet valve. Most important of all its effect is felt on the diaphragm, which, by its consequent movement, still further lifts the displacer, and drives more cold gas down to the hot side. This, therefore, by expanding, causes the initial lifting power to be reinforced, until a full stroke or travel is attained. As the gas, after passing the outlet valve, goes to the pinhole in the nipple, the rate of discharge to the atmosphere is comparatively limited, and pressure therefore increases rapidly in the intervening pipe and reservoir.

At the beginning of the upward motion of the displacer, the spring to which it is attached counterbalanced gravity, but towards the end of the upward stroke the spring has ceased to do so to any great extent. A point is, therefore, reached where the loss of assistance from the spring allows gravity to assert itself until it exactly equals the lifting power on the diaphragm. This would mean stoppage of further movement, and be equivalent to a dead center; but the momentum of the displacer coming into play, makes the travel extend beyond such a critical counterbalancing position. At this point the peculiarity of the diaphragm has to be considered. It was in a position giving maximum lifting area at half stroke; but its effect becomes rapidly diminished as it blows out.

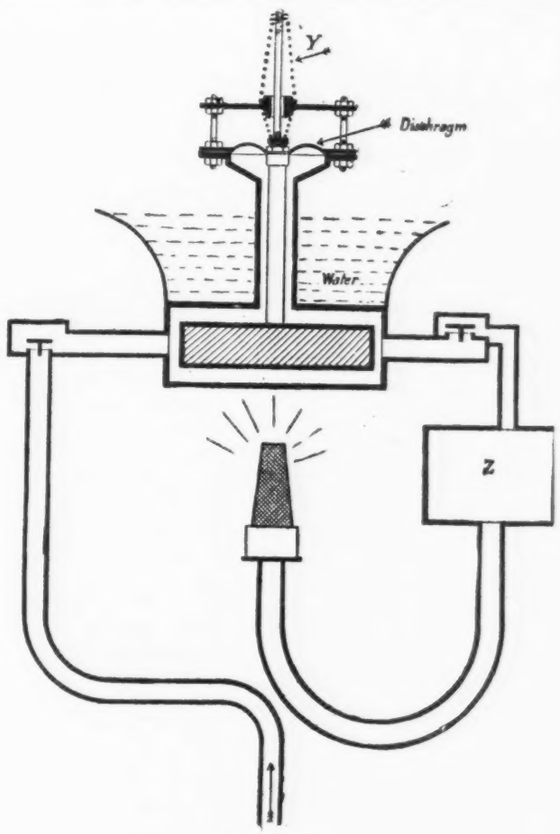


Diagram 5.

So that, as the displacer lifts, not only is the counterbalancing effect of the spring becoming more feeble, but the effective area of the diaphragm is also diminishing; hence the displacer, once in motion, will always travel beyond the point of equilibrium of the various forces, on account of its momentum.

The reaction, when the momentum is exhausted, is that due to gravity; and the displacer will naturally tend to fall back to such a point that the effective area of the diaphragm, multiplied by the pressure in the vessel, would counterbalance the gravity effect, or such amount as the spring in that particular position may fail to sustain.

Spheroidal Shape of Diaphragm under Pressure.
DISPLACER RISING.
2
Cone Shape of Diaphragm Due to Momentum of Displacer.
DISPLACER FULLY RAISED
3
Spheroidal Shape again Assumed Thus Starting Displacer Downwards
DISPLACER FALLING

Diagram 6.

This point, if reached in practice, would mean, as it were, a "dead center" on the down stroke. But such a trouble is avoided, because, when the displacer commences to fall, it also begins to transfer a part of the heated gas below it to the cold section above it; thus starting condensation and rapidly reducing pressure until a partial vacuum is set up, which increases in intensity as the displacer falls. Therefore, not only has the upward pressure on the diaphragm been destroyed, but a positive downward atmospheric pressure, tending to depress the dis-

placer, has been substituted, which rapidly drives down the displacer to its utmost limit.

In being so depressed, however, the displacer is causing abnormal compression of the sustaining spring, until its momentum becomes absorbed thereby. The diaphragm at the same time, by its motion below mid-stroke, is lessening in effective area, and therefore in depressing power. Another result also taking place at the same time is that the condition of partial vacuum set up by the depression of the displacer is causing a rapid influx of gas through the inlet valve, which quickly overcomes the vacuum and relieves the diaphragm of atmospheric pressure.

The displacer at its ultimate downward limit is, therefore, subject to the following conditions: There is no downward force on the diaphragm. On the contrary, the influx of gas, at the pressure of the gas main, is tending to lift it. Further, the spring, being abnormally compressed, is also tending to lift the displacer back to mid-stroke. All forces have, therefore, become reversed in direction, and a lifting power is in operation. Upon its way back to mid-stroke, at which the displacer would nominally come to rest, it causes a transfer of cold gas above it to the hot section below, and, therefore, the diaphragm, with an increasing effective area to act upon, is made subject to upward pressure, and the cycle repeats itself. The movement is therefore due to a sort of "hunting" effect, and results in a reciprocation of the displacer, at the rate of 120 cycles (up and down movements) per minute.

The peculiar action of a flexible diaphragm is interesting, and is illustrated in the diagram. A study of this will show that the diaphragm not only has a rapidly diminishing effective area as it gets extended, but that it seems to give a sharp reaction after causing the displacer to lift to its full limit. The momentum of the displacer causes the diaphragm, after blowing out in a spherical shape, to assume a conical form, which is, of course, contrary to its condition of equilibrium under pressure. In attempting to re-assume a spherical shape, it therefore draws the displacer downwards. Pressure on the diaphragm thus causes the displacer not only to be driven to the full extent of its upstroke, but also part of the way in the reverse direction. A spring is arranged under the bridge carrying the displacer sustaining spring to admit of an adjustable check to the momentum, and to start a rapid downward action in the event of the diaphragm being so stretched or slack that the cone shape is not reached when the displacer has attained its full stroke.

Such an apparatus as described constitutes a reciprocating engine which: (1) Has no piston, yet compresses the contents of the gas chamber; (2) has no slide valve, yet preserves a perfect cycle; 3) has no fly-wheel, yet cannot stop on a dead center; and (4) has no governor, yet accommodates its beat to the demand for gas. This last advantage is of very considerable importance; the rate of reciprocation being, in fact, according to the size of the gas nipple. For instance, a lamp may have but one burner and have a rate of 120 cycles per minute; but if three nipples be used, as for cluster work, the lamp will operate with greater rapidity, delivering three times the volume of gas, and, of course, it will have the waste heat from the three burners to energize it. Here it is interesting to note that the size of displacer, 6½ inches diameter by ¾-inch stroke, at present in use for one burner will supply three burners if needed.

It has been shown that the displacer in the heated lamp, once put in motion, will preserve its cycle. The reasons for self starting may now be investigated. If the valves be made of such a weight that they are lifted by the normal gas pressure, it will be found that 2 valves, when in series, chatter on their seats, and tend to set up a variation in pressure, or vibration, in the displacer chamber, which, being felt on a sensitive diaphragm, communicates motion to the displacer, and causes a slight dancing of the displacer on its spring. But we have already seen that any movement from mid-stroke, when a lamp is lighted, tends to become amplified by the change it brings about in the internal pressure. Therefore, any small initial movement, as the difference in temperatures between the top and bottom of the chamber becomes pronounced, will rapidly grow, and lead to the attainment of a full stroke. Another form of valve—and this is the type best adapted for starting—is a heavier kind, which will not allow gas at the normal pressure of the mains to find its way to the nipple by passing through the displacer chamber.

In this case, an appliance called a "reverter" is used. It may in brief be described as an automatic bye-pass, whereby the Bunsen burner is heated by low pressure gas until the intensifying commences, after which the lamp runs on high pressure alone. The introduction of this appliance enables heavy or spring loaded valves to be used, yet maintaining a good light at the burner. The lamp can thus be started without trusting to the chattering of light valves to affect the displacer through the diaphragm vibrations. The effect of heavy valves is as follows: When the lamp is cold, the displacer chamber necessarily contains an initial charge of either gas or air at atmospheric temperature. On heat being applied to the bottom of the chamber, the expansion caused thereby increases the pressure to an extent determined by the weight of the outlet valve; and it is this pressure transmitted to the diaphragm, which, of course, causes the displacer to be raised, and thus begin the cycle of movements already explained. Valves, if allowed to get dirty, prevent this initial pressure being achieved, on account of want of tightness. Such neglect does not prevent the lamp being started, as will be explained later on; but self starting becomes spoiled.

Referring to the reverter (diagram No. 7), gas at low pressure enters

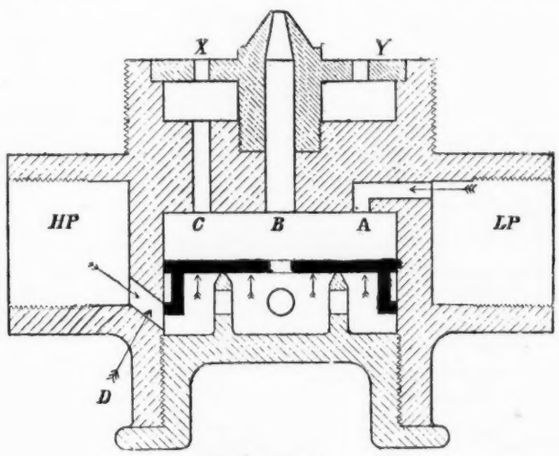


Diagram 7.

at *A*, and, the float being down, finds an exit up the center hole *B* and the side hole *C*. From the latter, it issues at the side apertures *X* and *Y*. The total gas aperture area for low pressure, therefore, consists of the openings *X*, *B* and *Y*; and while *B* is a standard aperture, and must not be touched, *X* and *Y* may be opened out, if necessary, to suit a very low local gas pressure for the lamp when in use as an ordinary low pressure lamp. A channel *D* makes a connection (under the float) with the high pressure pipe; and when the heat has taken effect on the intensifying chamber of the lamp above, to which the pipe is connected, the cycle commences, and delivery under pressure ensues. The rapid flow of gas which follows, lifts the float and closes the low pressure aperture *A*, as well as the hole *C*, whereby only the standard opening *B* is left at work. Should the lamp cease its action from any cause, or be cut off by a special tap provided on the lamp, and the supply of high pressure gas cease, the float will fall, thereby restarting the supplementary feed apertures, and maintaining a good light, even at low pressure. The aperture *B* alone would give but a small light, and take rather longer than desirable to heat up and start the lamp, if not supplemented by the feed from the additional holes *X* and *Y*.

The form of reverter above described has been modified to admit of easier attention to internal parts, which has been effected by subdividing its functions. The bye-pass arrangement is worked by a separate disk apart from the float (see section in diagram 8). It will be noticed that the governor stands immediately over the bye-pass valve, and the "aperture controlling float" is immediately under the burner; the whole being in one vertical line. They may be replaced or examined very easily by unscrewing the top of the bye-pass valve and removing it with all the appertaining parts mounted upon it. A point not to be overlooked in burning heated gas is that the nipple area requires adjustment. For instance, gas burning at 250° F. temperature will be expanded probably 30 per cent. over its original bulk when it was admitted to the lamp. The nipples, therefore, require slight enlargement over cold gas nipples. This admits of greater velocity of delivery, and therefore a sharper blast for drawing air into the burner.

It might be imagined that the process of maintaining a water charged head to each street lamp would involve a certain amount of trouble with ladder and bucket; but in practice it is dealt with in an extremely simple manner. A hollow shepherd's crook is hooked into the water filling aperature, and by a rubber attachment to a hand pump the water is delivered until it overflows. By such an appliance, and the use of the municipal water cart, it would take very little time to charge 100 lamps.

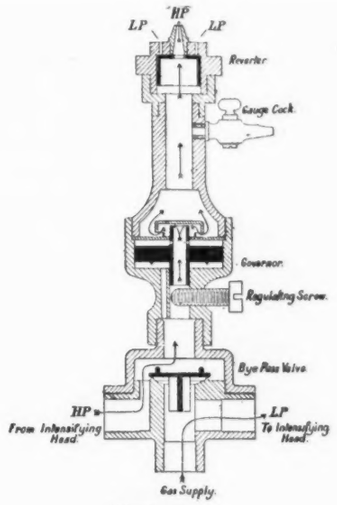


Diagram 8.

In considering the question of evaporation, some changes have been made from the original design. At first the desire to prolong the water filling intervals led the writer to take special precautions to prevent the temperature of the water reaching such a point as to cause visible evaporation. Readers of the gas papers will remember a diagram of one of the early lamps showing low ultimate temperature; but as the operation of refilling is so simple, he has preferred to re-arrange the lamp more with a view to getting at every part than in prolonging the intervals of water filling. The glass cleaning attendant can readily insert a wooden rod, perhaps once a month, or (say) when replacing the mantles, and see by the wetted surface how far the evaporation has reduced the water level. Again, in hotter countries, such as India, it would need extra precautions to counteract evaporation; and refilling is so simple that there is no justification for their introduction. All lamps are tested to see that, with a maximum possible water temperature 212° F.), the pressure is such as to give an ample margin over

Fig. 1.—Photograph of lamp actually running, but without mantle. Governed pressure, taken by gauge attached to cock between governor and nipple, 8¼ inches. Pressure in lamp reservoir, taken by gauge attached to cock at head of lamp, 27½ inches.

that required at the burner. It is unnecessary to point out that the pressure in the lamp reservoir is a matter of difference of temperature between the hot and cold sections of the lamp. A frozen water head would give pressures of probably 45 inches in the reservoir; while the same lamp, filled with boiling water, might fall in reservoir pressure to 20 inches. The Peebles governor would still maintain the nipple pressure at 8 or 10 inches throughout; so that no inconvenience occurs from change in reservoir pressure.

It has been pointed out that dirty valves may prevent a lamp automatically starting. The possibility of dirty valves is due to the heated gas in newly made lamps vaporizing the grease in the pipe joints they are made with graphite; but this disappears in due course—the lamps, in fact, improve by use. Each lamp is provided with a starting device, which enables the attendant, by pulling a light chain, to cause a pulsation of the gas in the displacer chamber; so that the lamp then enters into the intensifying stage, if sufficient heat has accumulated at its base.

Some of the lamps have been put to the test of continuous operation day and night for 160 consecutive hours, besides subsequent runs of 128 and 123 hours continuously, and the interior has then been found in good condition; no deposit of naphthaline being discovered. Indeed, it appears doubtful if such could exist in a lamp where the general temperature is so much above the normal. A photograph is here repro-

Fig. 2.—Photograph of lamp actually running, but without mantle. Gas enters water seal by the large rubber pipe ending in a vertical tube to bottom of glass jar. Lamp is sucking through thin metal pipe projecting horizontally and sealed into head of jar. A bye pass valve cuts out the water seal to admit of temporary gas supply for starting lamp. This is then closed, and the lamp draws through the seal. The gas supply pressure is 2 inches, water seal 4 inches deep, actual water sealing therefore, 2 inches. Lamp gauge is reading 13 inches.

duced of a lamp drawing through a water seal of 4 inches; the normal gas pressure being 2 inches. The lamp is, therefore, sucking gas against

Fig. 3.—Elevation of lamp in square lantern, showing inlet valve with starting device on one side, and outlet valve with connection to reservoir on the other side.

a seal of 2 inches. This is interesting, as showing that these lamps will run on the very lowest gas ***pressures*** provided there is plenty of ***volume***

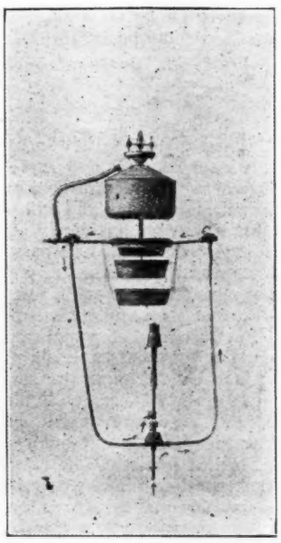


Fig. 4.—Rough skeleton of lamp (lanterns, reflectors, etc., removed) showing simplicity of vital organs. Arrows show course of gas through pipe to inlet valve, onward to intensifier, out through outlet valve, and down to burner. Connection to reservoir above is also shown. The hot dish is suspended over the burner, the displacer dish, which nests into it, is shown immediately above, and the cold dish, which also rests into displacer is shown with valve pipes attached. When the hot and cold dishes are clamped flange to flange, the displacer has a vertical movement of about ¾ inch.

available. The supply pipe should never be less than ½ inch in diameter, as the double reciprocation of the displacer is at the rate of 120 per minute, or only half a second for the complete cycle of drawing in a gas charge, heating, expanding and ejecting it. If, then, a lamp be feeding a 540-candle power burner with 15 feet of gas, it will deal with over 3½ cubic inches of gas per cycle; and, at 120 cycles per minute, not more than a period of a quarter of a second at the outside is available for the drawing in of the gas charge.

As evidence of the extent of improvement effected in gas lighting devices, it is of interest to note that the step up from a 15-candle power batswing burner giving 3 candles per foot, to a self-intensifying lamp giving 540 candles from a single burner, is as follows: The efficiency is increased 12 times. The unit of light is increased 36 times. These results are of some significance in the competition with electricity. Expressed in other words, it may be said that gas enters the lamp having a value of 62 cents per 1,000 cubic feet; but the light attained gives such service that it is equivalent to reducing the price of gas 5 cents per 1,000 cubic feet.

Of course, there is nothing even now (beyond inconvenient size of mantle) to prevent a much larger unit of light being attained. The author expects, in fact, to get shortly a unit of 1,000-candle power without very material changes in the mantle dimensions. Foreign laboratories have reported the lamp as giving 38½-candle power per cubic foot; and with certain other adjustments specially suited to the conditions of gas consumed hot—in which the lamp now described differs from any other pressure system—40-candle power per foot will probably be attained. A burner using 25 cubic feet would then give 1,000-candle power at the mantle; and the writer does not think that the diameter of the mantle for such a light would be increased as much as an inch beyond the present 300-candle power mantles.

The large unit of light from a single mantle, of course, reduces the number of mantles required to light a given length of street, and reduces the number of pilot lights to the same extent; it, therefore, economizes expenditure where such economy is at present most required. For instance, in mantles, 5 burners of 100-candle power each would involve a greater charge for renewals than would one lamp with a single mantle of 500-candle power.

The pilot light, if in use for 16 hours per diem, will consume (say) ¼ cubic foot per hour, 4 cubic feet of gas.

If used on a burner consuming 4 cubic feet per hour, and burning 8 hours per diem, the pilot light will add 12½ per cent. to the gas bill, or equivalent to one hour extra lighting.

If used on a high pressure burner consuming 10½ feet per hour, the pilot will add not quite 5 per cent. to the gas bill, or equal to 23 minutes' extra lighting.

With a 2-burner lamp, giving 1,000-candle power, and using 30 feet of gas, the pilot will only add a little over 1½ per cent. to the bill, or equal to 8 minutes' extra lighting.

As large unit lights are relatively so far apart, and the pilots are so much reduced in number per unit length of street, it is a matter of no material economy to dispense with them; on the other hand, the life of the mantles would be prolonged by avoiding the jar involved in torch insertion into a lantern.

With the competition of rival illuminants, it is interesting to make calculations of the cost of lighting per 1,000-candle power with burners giving 35-candle power per foot of gas; and the writer does not feel that the gas industry is moribund in street lighting when it is able from its mains already laid, at the bare cost of a self-intensifying lamp (no other capital expenditure being involved), to produce a unit of light comparable with any rival, and free from many of the drawbacks of other illuminants.

Waste heat is, therefore, a valuable product, raising the light giving power of the gas from 20 or 25-candle power per foot, to 35-candle power per foot, or equivalent in effect, let us say, to reducing the price of gas in incandescent lighting from 75 cents to 50 cents per 1,000 cubic feet.

The Cultural Value of Engineering Education.

In the Presidential address, delivered by F. O. Marvin, Mem. Am. Soc. C. E., Dean of the School of Engineering, University of Kansas, Lawrence, Kan., on the occasion of the annual convention of the Society for the Promotion of Engineering Education, the speaker said:

There seem to be certain fundamental qualities which must be possessed before a man can be classed with cultured people, qualities which are only acquired after a considerable experience in life, but which are influenced greatly by the years of student training and therefore fit subjects for discussion here. Far be it from the purpose of this paper to attempt a definition of culture or a setting forth of its elements in any completeness; rather the emphasizing of some things that relate to it, especially with reference to the education of young engineers.

1. The man of culture must be a thinking and reflecting being. There must be not only the ability but the habit; and this is no easy thing to acquire. Modern American life is full of hurry, full of affairs that demand instant attention, and one matter follows another with rapid succession. Men seek short cuts to fortune. In the popular opinion, the men who act quickly, the men of decision, are those who succeed. But there is a danger here. Back of the action, behind the sharp decision, must lie a mature judgment, and how else is this to be formed except as a result of deliberate reflection? The decisive act which is also right rests on a process of thinking and judging that has been long fostered until it has become a habit, until there are established certain standards by which things are to be measured.

The early steps of this training are necessarily slow and we, as teachers of engineers, must recognize this and not yield to the temptation to crowd our students over too much ground on the one hand or on the other to lead them through short cuts across country by empirical paths that may give them ease and quickness of travel, but little or no reason why the path is chosen. Let them go the long road. I do not by any means wish our teaching to be non-practical—rather more practical in the best sense; but first, last and all the time, let students be trained to do their own thinking and to form their own judgments; to test the statements of others by the workings of their own mental processes.

2. There is another element of culture that comes in here, an ethical one, that of forming right judgments. Men may have the appearance of culture without its true spirit which is essentially honest. A class room is no place to preach a sermon, but there can be there imparted a respect for truth and perfect honesty. A teacher's attitude should always be open and frank, that of a sincere seeker after truth. He should never dodge an honest question, and be ever ready to say "I do not know" if he does not.

3. There can be no true culture for a man that does not put his cultivated powers to some useful service, and here there must be such degree of mastery over the chosen profession or business as will result in a special skill and dexterity. Here in early years the engineering student has the advantage of the student in arts. Study for knowledge's sake may be stimulating to the few, but for the many there is needed the goal of a special calling to secure the close application that results in ability to concentrate one's energy to the attainment of a certain end. But here again comes a danger, that of too early or over specialization, and the following of short cuts to professional life that are advocated by some,

ways, in the eyes of the world as well as in their own, have been eminently successful as specialists.

4. In order to form conclusions that are appropriate and correct there is needed then breadth of view; a quality that has been expressed by the word poise. A man of poise, of even balance, will see things in their right relations and due proportions; he will weigh matters giving to each component part its just degree of importance. He will the better understand the motives that underlie other men's actions and the more readily use them to suit his own purpose. He will be more apt to rightly interpret the new movements in the world of thought or action and can seize opportunity for a personal advantage or a larger sphere of service before others see that there is such.

The value of mathematics and the physical sciences with their applications to technical things needs no discussion here, for these are the engineer's tools; but it is a fair question whether in our desire to graduate students that can be early useful we do not place too much stress on technical things to the exclusion of others that give greater breadth of training.

Engineers have to deal with other things besides materials and physical laws; they must manage men and matters of finance. If they are to rightly influence those whose capital they are employed to expend, they must be able to meet them socially and intellectually, to discuss intelligently matters outside of the pale of strictly professional life. Evidence of professional ability and skill is, of course, first demanded, but breadth of culture creates an added confidence in the wisdom of the conclusions reached and the advice given.

Engineering practice is changing, as conditions become older and more settled and more and more practitioners find their work in communities and busy centers of trade where they are constantly thrown into close contact with strong and cultured men.

5. It is not sufficient to form correct judgments only; there must be added a skillful and effective presentation of them in well chosen and fitting English.

The time given to English in our courses is not enough to properly train students in its use and at the same time open the doors to our best literature. It may be said that all of this English work should be done in the preparatory school, and it is probably true that the character and quality of the high school English is better to-day than it has been heretofore. Yet it seems to me that engineering students should have some training of a college grade along the line of literature.

6. To the writer's mind, there is another element of culture that should enter into an engineer's training, viz., an appreciation for beauty. The engineer is a designer, and it is important that he should embody his design in artistic form if he is to fulfill his whole mission and please and gratify others by the perfection of his work. The engineering student devotes a good share of his time to the drawing board, and much can be done here toward the cultivation of this quality by an instructor who possesses it.

7. The possession of agreeable manners and tact is another evidence of culture. Not merely the conventional bearing of polite society, though this has its value. This alone is but a husk which must cover the real kernel, refined and gentle feeling; and such feeling is the result of moral and intellectual convictions. The teacher's personality has very much to do with this matter. If he is of coarse grain, of domineering or selfish disposition, his influence will not tend toward the production of true gentlemen.

And now for the real question: Does engineering education tend to produce culture? Science has modified and is still changing the ideas of culture that men hold. This much is clear, however, that no one existing course of educational training has a monopoly of cultural methods; nor will the completion of any college course necessarily secure its attainment, because of its personal quality. Further, culture is the result of life, and the most that can be expected of a college course is to open the student's eyes to its real worth, to start him rightly with certain leanings and aptitudes and furnish him with the means of a continuous growth toward its maturity.

It is maintained that an engineering course can tend in this direction, and that in some of our best colleges, under the instruction of people themselves cultured, it does so tend to-day.

As one looks forward 10 or 20 years and attempts from present tendencies to forecast the work and social standing of engineers, he must see that the profession will be doing a larger work and exerting a greater influence, and that an engineering training will be more and more recognized as the one best fitted to lead to positions of an executive nature in connection with industrial enterprises and in the administration of public works. Everywhere will be demanded expert skill, sound judgment and broad views, primarily because these will be found to be economical.

There are two tendencies in the present day engineering education that are, in my judgment, opposed to the desirable result. First, a tendency to crowd too much of the foundation work back upon the preparatory school, already overloaded. This Society's Committee on Entrance Requirements has advocated a standard which is high enough. Second, the allowing of technical subjects to crowd the fundamental general ones from the college course in a vain attempt to do what from the very nature of the case cannot be done, make an engineer by college study.

The result of this in some institutions is further seen in too early a differentiation between the various engineering courses; so that, for instance, the civil student knows nothing of applied electricity, and the electrical student nothing of surveying; while neither has a chance to acquire a taste for literature.

The whole problem is an involved and complicated one, but there is a way out that must be found if the engineer is to fill the important place that awaits him. One part of the solution will be found probably in a refining of the methods of instruction, so that better results may be reached in the same time. In the end, however, the writer thinks that there must come a deeper sense that after all life is long, that it should be taken with more of deliberation, and that it is the end that is important, rather than the beginning. The feverish rush and haste to be earning must be replaced by a recognition of the real necessity for a full rounded out preparation if the largest and best service is to be given. Then the student will be glad to spend the one or two extra years in college that may be demanded. The wise student now will do this without its being required.

An Electrically Heated and Electrically Controlled Thermostat.

[By Mr. S. W. Young, in *Jour. Am. Chem. Soc.*]

I recently found myself, on account of a very irregular and inferior gas supply, forced to devise some other means than the one usually employed, for heating and regulating the thermostat. After a few preliminary experiments the apparatus herein described was developed, and has, after considerable experience, shown itself to be thoroughly satisfactory—in many respects more satisfactory than the usual form with gas heating.

For this latter reason it seemed worth while to publish a brief description of the apparatus, in the hope that use might be made of it by others. As will be readily seen, the principle allows of very ready application to thermostats for biological laboratories, such as are used for the purpose of maintaining constant temperatures in paraffine baths for imbedding, etc., and for incubators and the like. Some forms of the apparatus for these purposes are being tested and, if successful, will perhaps be described elsewhere, later.

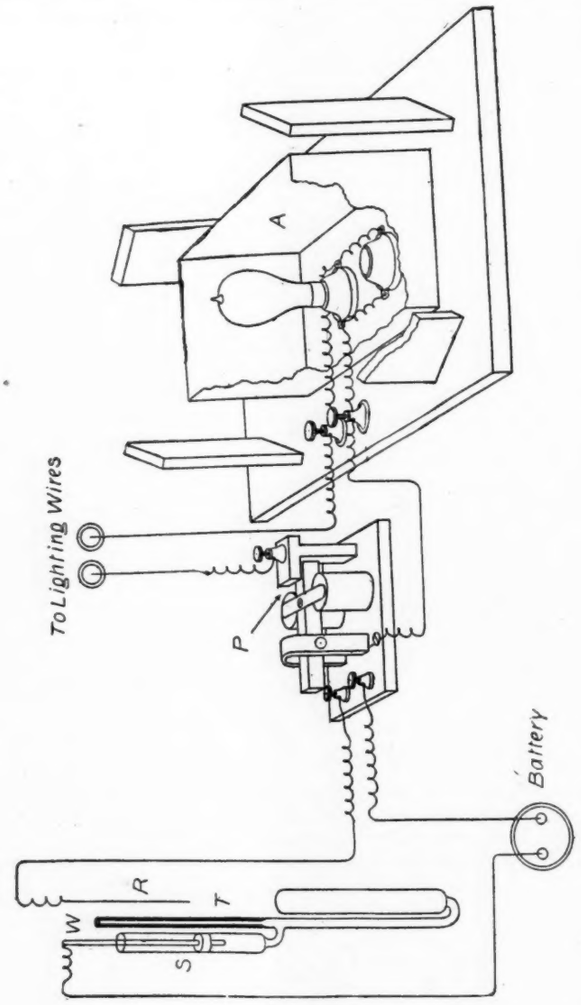
The apparatus consists of four essential parts: (1) the bath (not shown in diagram); (2) the heater; (3) the interrupter; (4) the regulator.

1. *The Bath.*—This may be of any desired form. For my purposes, I used a cylindrical agate ware can covered with felt. The capacity was about 30 to 35 liters. The general arrangement of the bath is identical with that of the usual Ostwald thermostat and needs no further description.

2. *The Heater.*—This consists of a square board of convenient dimensions, upon which near the center are screwed two or more incandescent light receptacles, which are wired up parallel, as usual. Surrounding these is an asbestos box open at top and bottom, which serves to economize heat. For heating purposes incandescent lamps are used and have been found very satisfactory for low temperatures, although it may be questionable whether they would prove sufficiently durable at higher temperatures. For maintaining my 30-liter thermostat at 25° C., I have found that one 16 c. p. and one 8 c. p. 100 v. lamp acting together were wholly sufficient. The four uprights at the corners of the base board serve as supports for the bath.

3. *The Interrupter.*—This I made by the reconstruction of a telegraphic sounder. The wiring of the current to the lamps is so arranged that when the armature is raised the current passes through it and the lamps remain lighted. When the armature is pulled down the current to the lamps is interrupted at *P*, and the lights go out. It goes without saying that platinum contacts are preferable.

4. *The Regulator.*—This is a modification of the ordinary form of the gas regulator. The principal modification lies in the side tube *S*. This is provided with a piston carrying a stout iron or platinum wire *W*. In filling the regulator, it is so arranged that the whole space below the piston is filled with mercury and a layer of mercury is placed on the top



of the piston. This allows: (1) connection between the mercury of the regulator and the battery cell; (2) it allows of the regulation of the height of the mercury in the capillary tube *T*, by raising and lowering the piston. In this way the regulator can be set for any desired temperature. The piston may be made of a piece of cork, fastened to the wire by cement. There is no particular difficulty in making such a piston mercury tight. Finally the wire *R* is so arranged that it can be placed at any desired height in *T*. It serves to complete the circuit through regulator, battery and interrupter when, by warming, the mercury shall have risen in *T* to such a height that contact is made with *R*. It also serves for the final, exact regulation of the temperature.

The action of the whole apparatus is then as follows: The bath is placed over the heater and the regulator in the bath (which must naturally be mechanically stirred.); the current is turned on through the lamps which warm the bath; this warming expands the mercury and toluene in the regulator, until finally contact is made between the wire *R* and the mercury in *T;* this closes the circuit through the battery and interrupter, drawing down the armature of the latter and interrupting the current through the lamps; cooling follows, the contact between the mercury and *R* is broken and the current again made through the lamps. Thus the temperature in the bath is maintained constant to within small limits. In general the temperature of my thermostat never varied more than from two to three-hundredths of a degree. By taking special precautions (avoidance of draughts, etc.), I have been able to avoid any variation greater than one-hundredth degree for over four hours. Temperature variations were noted with the aid of a Beckmann thermometer.

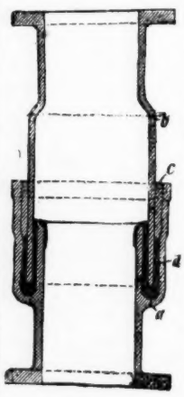
I should like to state here that, from my experience with thermostats, I have been convinced that the fineness of the regulation of the temperature demands not so much sensitiveness, *i. e.*, large linear motion for small temperature change in that part of the regulator where the cut off is, but rather rapidity of response on the part of the expansive medium to temperature changes. In the ordinary bulb regulator, the lag of the expansion and contraction of the toluene is the most fruitful source of variation, when the sensitiveness of the regulator has been otherwise highly developed. This defect is to be best met, not by increasing the quantity of expansive liquid, but by distributing it in such a way that there will be greater surface exposed; *i. e.*, in annular or spiral bulbs. I have made no experiments in this direction as the apparatus above described was wholly sufficient for my purposes.

Certain modifications of the above apparatus will naturally suggest themselves, such as use of platinum wires instead of lamps, etc., but the apparatus as described has worked so satisfactorily that I have let well enough alone.

Certain advantages, such as affording no danger from fire, cleanliness, etc., need not be enumerated here.

A Retort House Wrinkle.

Mr. Frederick Egner, in noting the following "plain" wrinkle, declares that it must be new, since letters patent for it were recently issued by the German Patent Office, which office he declares is never guilty of issuing patent protection, if anything like the patented article can be traced in or to ancient records—epitaphs not excluded.



The inventor, in his application, opened by remarking that he often noticed that the joints around standpipes, at the junction with the retort mouthpieces, are difficult to keep from leaking; hence the invented device.

The illustration shows in section an upper and lower piece of pipe. The latter is that which is to be bolted to the retort mouthpiece. It is provided at *a* with a cup designed to contain tar into which the upper piece end is sealed thereby. The seal is maintained by such of the tar as may condense in its passage up the standpipe, and the surplus runs over into the mouthpiece as it would do if there were no cup to the lower part of the pipe. An ordinary joint may be added, as shown at *c*. As will be seen, *b* and *a* together form a neat expansion joint, and a gas-tight one as well. To date no American patent has been issued on the device.

The Shrinkage of Natural Gas.

"G. E. W.," writing in the *Scientific American*, says that the value of the natural gas supply in the West has been such as to convert otherwise unfavorable localities into thriving industrial towns and manufacturing centers, and in some places the gradual exhaustion of the fields of gas has reconverted the communities into deserted towns and villages very much as the exhaustion of gold mines repeatedly did in California and Colorado. It was not many years ago that consumers looked upon the supply of natural gas as something without end or limit, and for decades the gas was foolishly wasted. The notes of warning which were sounded some 10 years ago have in recent years been heeded, and in most localities the gas is carefully saved from all waste. But this has not come about until almost too late in some sections, and the pressure is reduced almost to the point where it hardly pays to use it.

Formerly the gas was used freely without any attempt being made to measure it, but to-day consumers have their gas supplied to them through meters, and they pay for the quantity they use. This system has abated the wasteful methods, and it is estimated that 1 cubic foot to-day accomplishes as much as 3 cubic feet did before. In lighting purposes the gas is further saved by using the incandescent mantle, which gives a certain light at much less expense than when the gas is burned alone without the mantles. In the distribution of the gas in Pennsylvania there are several other methods for preventing waste, the most important of which is the use of smaller size mains.

The reduction in the pressure of the gas is the first and pretty evident sign that the supply is giving out, and in most of the old gas regions this pressure has decreased marvelously, while in a few new ones, such as in West Virginia, there has so far been no diminution in the pressure.

At one of the earliest natural gas regions operated, the State of Pennsylvania shows the greatest evidence of gas exhaustion, and at the same time the companies operating the wells have shown the most de-

ure to economize in the sale and distribution of it. Regions that were formerly dependent upon the gas for fuel and for house heating are gradually abondoning natural gas for these purposes, but it is being employed for other industries in which it pays better. The natural gas engines have greatly multiplied in Pennsylvania, and they are being used more every year. Natural gas engines for pumping wells can be used much more advantageously than steam. This is particularly true where the pipes have to run a long distance. The loss of steam through condensation in passing through a long steam pipe is great, while there is absolutely no loss in conducting the natural gas through the longest pipes.

A growing use of the gas is for operating air compressors, and then the rest of the machinery is run by the compressed air. This has been found to be the most economical use of the natural gas engines.

Some of the largest iron and steel mills in Pittsburgh have natural gas pipes running into them, and certain kinds of machinery are operated entirely by this fuel. There are over 5,000 miles of natural gas pipes in Pennsylvania, and these distribute the fuel to widely separated interests and territories.

Nevertheless, the pressure has been steadily decreasing in Pennsylvania, where the value of the product declined from $19,282,375 in 1888 to $6,242,543 in 1897, and even to a much further limit in 1900. But through the economizing of the gas for manufacturing purposes it is possible that the supply will last many years yet in some regions, while in others the life of the wells cannot be estimated at more than 5 or 10 years. New wells are constantly being drilled, but the proportion of paying ones to the unprofitable ones is steadily decreasing, while old wells are being annually abandoned.

In Indiana, where there are nearly 5,000 miles of natural gas pipes, the pressure has declined quite rapidly in some regions in the past 10 years. From 1886 to 1897 the pressure fell from 325 pounds to 195 pounds according to the State Geologist's report, while in 1898 it fell to 181 pounds. When it is understood that practical workers in the field believe that when the pressure gets below 100 pounds to the square inch the majority of the wells cannot be worked profitably, the importance of this steady reduction in the pressure can be appreciated. The natural gas in the Trenton limestone rocks of Indiana is found at a depth of 1,000 feet, and this extreme depth makes the sinking and operation of wells expensive.

In Fairfield county, O., which supplies gas to such cities as Columbus, Lancaster, Athens and Chillicothe, the wells are sunk to an average depth of 2,000 and more feet, and the pressure is 800 pounds to the square inch. This field is comparatively new, and new wells have been rapidly sunk there, and the pressure has not materially declined. In the northwestern part of Ohio, however, the decline in the pressure has been from 450 pounds in 1888 to 30 pounds in 1897. There are about 600 producing wells in this part of the State, and fully half a hundred are abandoned every year, while a large percentage of the new ones drilled do not produce. The condition of the fields is thus far less encouraging than formerly, and in the past decade the value of natural gas in Ohio has declined from a little over five million dollars to less than two millions. As in Pennsylvania, the use of the gas has greatly changed in recent years, and companies are making every effort to economize with it.

The natural gas supply of New York, Illinois, Kansas and Missouri is far less than either of the other States mentioned, but the pressure has also steadily decreased in these portions of the country. The work of sinking new wells in these States has declined because the companies have found less and less profit in the enterprise. Some old gas sections are entirely abandoned, and the wells now in operation hardly supply enough to feed the industries dependent upon the fuel.

In West Virginia and Canada the use of natural gas has increased in recent years, and these two fields have great promises. In 1888 there was hardly a dozen natural gas wells producing in West Virginia, while in 1897 there were over 150, of which 47 had been drilled in the last 6 months. To-day there are upward of 250 producing wells in the State, with new ones being steadily sunk. The depth of the wells in that State varies from 1,200 to 2,800 feet, and the cost of drilling runs from $1 to $1.50 per foot. The pressure varies fully as much as the depth of the wells. In some of the new wells it has been found to be as high as 1,100 pounds to the square inch, and in other places it rarely reaches 100 pounds. This great difference in the pressure makes the matter of exhaustion very uncertain, but experts believe that with proper care and avoidance of waste the West Virginia gas regions will continue to supply this valuable fuel for many years to come. Certain it is that there is no sign of exhaustion to frighten the owners for the next decade.

Canada is a rich natural gas region which has only been recently tapped, and in the last few years several hundred miles of pipes have been laid to bring the gas into the United States. Like the mineral resources of Canada, the natural gas supply north of us is only poorly understood or measured, and for all that we know there are fields of it sufficient to keep our industries going for half a century. But in this country, especially in the old regions where gas has been used for years, the supply is steadily decreasing, and some industries that were originally built up by the cheap fuel have either changed their location or made preparations to adopt other fuel. At present all efforts are being made to prolong the life of the wells that are already in operation.

As the pressure of the gas decreases the wells are apt to fill with water, and this greatly diminishes their usefulness. Trouble of this kind is constant, and a good deal of extra engineering work is required to keep the wells free from the water.

Some Interesting Facts Connected with the History of the Old New Orleans (La.) Gas Light Company.

The following recital of events connected with the history of the New Orleans Gas Light Company, which is now operated under leasehold by the New Orleans Lighting Company, under the management of Mr. Fred. H. Shelton and his associates, forms an interesting story—it originally appeared in the columns of the *Times-Democrat:*

Many interesting entries are to be found in the old inventory books and other volumes of record of the New Orleans Gas Light Company, which furnish hitherto unpublished history of the second oldest Gas Company in America, during the cloudy and tempestuous days of the early sixties in the South.

These records tell of the losses sustained by concerns doing business in New Orleans during the war, and, for that matter, give an idea of the financial vicissitudes of incorporated companies in the other old slave States.

Bankson Taylor, Manager of the New Orleans Lighting Company, after going over the books of the New Orleans Gas Light Company, says the money losses sustained by the corporation through the emancipation proclamation of President Lincoln was $51,650. This amount represented the value of 62 slaves owned by the Company at the time of the occupying of New Orleans by the Federal forces.

These slaves had been accumulated by the Company since 1835, or the year of the organization of the then New Orleans Gas Light and Banking Company. While the Company maintained a few slaves who were put to work about the station in 1836, the sweeping substitution of such labor for white labor was not made until 1848, as the following extract from the minutes of the monthly meeting, March 6, of that year testify:

"A report from the Superintendent and Engineer of the Company, made at the suggestion of the President, upon the practicability of substituting slave labor for white labor at the station and on the street mains, as well as lighting the public lamps, was received and read, and after discussion the apparent economy of slave labor, from the estimate of the Engineer, determined the Board to authorize the Engineer to make the experiment, and on motion, it was

"*Resolved*, That the Engineer of the Company be authorized to purchase from time to time as in his judgment he may deem advisable, with the sanction of the President, such slaves as will answer the purpose contemplated, either as stokers and laborers, as well as the necessary mechanics to supply the place of the white labor now of necessity employed at so large an expenditure, and that the Treasurer be, and he is hereby authorized, to accept the acts of sale of such negroes and pay for their cost."

From the time the order was issued, the Company, at various intervals, increased the number of its slaves to 62, when all were released by the proclamation of the President in 1863.

The inventory of these slaves gave the name of the slave, the year bought, present age, cost price and present value. It is interesting to note how the value of a slave changed from year to year. For instance, a young fellow, Nat, was bought for $1,300, and his price in 5 years was marked down to $600, on account of some weakness he had. Crawford and wife were bought in 1836 for $2,800, and in 1862 were valued at $900. Both had grown too old to do any appreciable amount of labor for the Company, but their investment was not a bad one. Crawford's wife bore 6 children who were given an aggregate value of $2,900.

As the slaves advanced in years they were gradually marked down in value, as, for instance, Leonard, who cost his owners $1,200 at the age of 43, was reckoned as being worth only $400 fourteen years after. Then, on the other hand, the young slaves, as they matured, increased in value during the years they rendered good service to the Company, Henry Barnes, when 29 years of age, was bought for $750, and at the date of President Lincoln's first proclamation of emancipation, was valued at $1,000.

It will be semembered that New Orleans was one of the localities exempted from the provisions of President Lincoln's first proclamation of emancipation, issued Sept. 22, 1862, to take effect Jan. 1, 1863, and this accounts for the fact that the owners of slaves in this city held on to their human properties for a greater length of time than the slave owners of the majority of the Southern States.

In addition to the slaves, there were other large items transferred to the profit and loss account of the ledger as the result of the civil war. The inventory showed Confederate notes on hand June 1, 1862, amounting to $25,050, and assorted Confederate shin plasters amounting to $8,535. These assets disappeared from the books in the inventory of Jan. 1, 1865.

Some of the good assets of the Company which bring forth recollections of the stage in New Orleans and St. Louis during the civil war were 6 notes given by Ben De Bar, the noted impresario and well known actor in those days. De Bar gave the Company 6 notes in 1867, each calling for $14,285, at 7½ per cent. interest, payable Jan. 11 in the years 1868, 1869, 1870, 1871, 1872 and 1873, on which he was advanced the money to carry on his theatrical enterprises. These notes were secured by a mortgage on the old St. Charles Theater. The Secretary of the Company, in speaking of these notes, states that De Bar was never able to liquidate all of the principal, although the interest he paid was more than equal to the original loan.

According to the minutes of the meetings of the Company's Directors after the month of May, in 1862, the President, P. N. Wood, was absent from the city. In his absence hangs a tale which is always a delightful one for the New Orleans inhabitants of the war period to remember.

When Ben Butler came to town, in 1862, with the Federal forces, and sought to confiscate everything of value belonging to the sympathizers of the Southern cause, he did not forget to call upon the bankers for all the gold they had in their vaults. Butler seemed surprised to learn that all this gold had been shipped over the New Orleans, Jackson and Great Northern Railroad, now the Illinois Central, to Camp Moore, the nearest Confederate post, in Tangipahoa. The coin was taken from the city when the warning came from down the river that the Federal troops were about to make their entrance.

Butler, not to be baffled in the confiscation of such an important item, at once called a meeting of all the bankers in New Orleans and demanded that the gold be returned to the banks. The bankers coincided with the General's views, and resolved that it was a rather unfair thing to do to put their money in the custody of the Confederates, and a resolution empowering P. N. Wood, President of the Merchants' Bank, to get the coin was passed.

Then the town's risibilities were shaken. Mr. Wood went as he was directed, but he never came back. He kept close watch on that gold for a year, when he died in the Confederate camp. He had no intention of returning to the city with the money until it was beyond all danger of confiscation by Gen. Butler. It was all returned to the respective banks at the end of hostilities.

Devices for Handling Extreme Potentials.

The *Electrical World* says that switchboards and appliances adapted to the safe and convenient manipulation of the high potentials now used for long distance transmission work have not in general kept pace with the development of the apparatus and appliances for the production of these high potentials. The apparatus illustrated herewith for this work, though new to the trade, has been thoroughly tried and proved successful.

To handle safely potentials from 5,000 to 60,000 volts requires apparatus designed and constructed with special care. Probably the most important piece of apparatus for high voltage work is a thoroughly reliable switch for connecting high potential transformers and generators to lines at the generating end of a transmitting system, and for connecting high potential lines to step-down transformers at the receiving end.

The S. K. C. combination switch and fuse is built for pressures of 10,000 volts and higher, and of 100 amperes capacity. They are in use on the 60,000-volt circuits of the Standard Electric Company, of California, and the Bay Counties Power Company, of California.

This type of switch depends for its successful operation on the drawing of a metal fuse through a non-conducting powder which is inclosed in an insulated tube. The arc formed due to the breaking of contacts is ruptured as the fuse passes quickly through the powder. Figs. 1 and 2

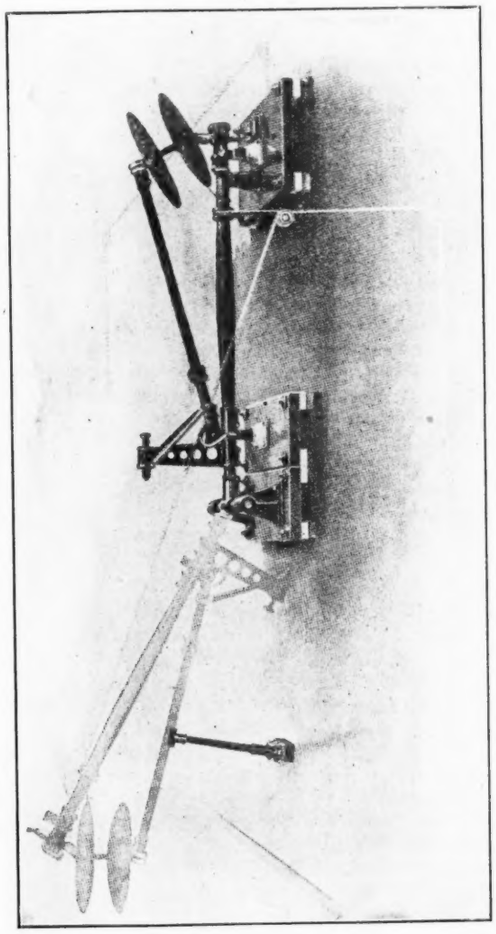


Fig. 1.—Two Positions of Switch.

illustrate the three positions of a single throw switch. The combination consists of the main arm, an auxiliary arm, a fuse and fuse holder, and the two terminal jaws, together with the mechanical details for the proper operation of the switch.

The main arm is a wooden rod, hinged at the bottom and having mounted on the top two zinc jaws which clamp one end of the fuse. On this main arm are also mounted two blades which make the contact with the terminal jaws. The upper blade is electrically connected to the zinc jaws, while the lower blade is connected to the auxiliary arm by means of a cable.

As the circuit is never meant to be broken between the terminal jaw and blade, but by allowing the fuse to slip from the zinc jaws the main arm is locked in its upright position and cannot be unlocked until the auxiliary arm has dropped into the horizontal position of Fig. 2, thus breaking the circuit.

The auxiliary arm consists of a hollow wooden rod hinged to the main arm at the bottom and having mounted on the top two zinc plates, which form the holding device for the other end of the fuse. Inside the wooden arm is a copper rod forming the connection between these plates and the cable connecting with the lower blade on the main arm. This auxiliary arm is intended to be pulled sharply away by the spring in the event of the unlatching of the fuse or the fuse blowing. The jar of its falling is taken up by the dashpot on the bracelet attached to the main arm. The switch is set sufficiently high not to come within striking distance of the attendant's head.

The fuse holder consists of a hollow insulating tube having perforated corks and large washers at each end, and containing the non-conducting

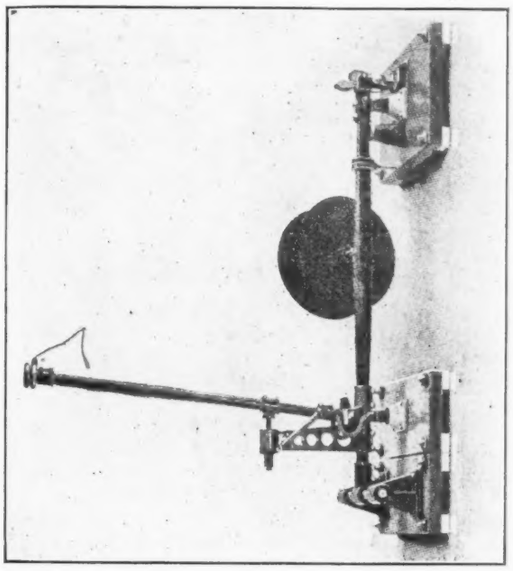


Fig 2.—Horizontal Position.

non-fusible powder through which the fuse is drawn. It is tied to the main arm to prevent its falling to the floor when no longer supported by the fuse. The fuse inclosed in the fuse holder is held in position between the main and the auxiliary arms by means of the zinc jaws on the top end of the main arm and the zinc plates on the auxiliary arm.

The jaws forming the terminals are mounted on separate pieces of marble and are thoroughly insulated by means of porcelains and bushings so as to avoid any leakage to the marble. On the upper terminal marble is also mounted the catch, operated by a rope, and which opens the zinc jaws on the main arm, releasing the fuse.

Observing the switch in its normal position, the current enters at the upper terminal, passes to the zinc jaws on the main arm, then through the fuse to the auxiliary arm, down the auxiliary arm and through the cable to the lower blade on the main arm and thence through the lower terminal out. Pulling the rope attached to the catch opens the jaws and releases one end of the fuse. The fuse, thereupon, is passed rapidly through the non-conducting powder in the fuse holder by the auxiliary arm falling into a horizontal position, breaking the circuit and rupturing the arc.

The main arm may now be unlocked from the catch, and the whole combination allowed to swing down into position where easy access can be had to the working parts, and thus the fuse reset. This position is shown by the skeleton section of Fig. 1. After the fuse has been reset the whole combination is brought into its normal position by a rope attached to the main arm. As the combination is primarily a switch and not a fuse, the fuse is made sufficiently heavy so as to avoid its blowing under anything but extreme conditions. If on any account the fuse should blow, the action is precisely similar, except that the breaking takes place in the center of the tube instead of at the jaws.

Acetylene Stoves and Their Application.[1]

By A. J. Murdock, M.D., Minneapolis, Minn.

There has been, and is now, a general impression abroad that acetylene gas cannot be used for cooking purposes. Not only among those who have been actively engaged in promoting acetylene lighting, but the general public as well.

One of the first questions asked by a purchaser of an acetylene lighting plant is, "Can we use this gas for cooking purposes?" The answer has been "No." Some of the earlier experiments were made with ordinary burners used for city gas, with the result at least of shocking the nerves and conveying the impression that acetylene gas was something that could not be safely manipulated. This was largely due to the disastrous results from explosions of compressed gas, and the fear and prejudice created at that time had a deterrent effect on experimenters along these lines.

1. *The Metal Worker.*

We began our experiments with acetylene gas for cooking about 2 years ago, and have continued them uninterruptedly until recently, and we desire to state that of the hundreds of different devices for burners constructed and tested by us, not the slightest accident has resulted to our workmen, nor injury to material used in the experiments. This was a new field of work. There were no guides, no rules, no precedents, no experiences, of either success or failures. No gas burner ever made previous to this time was adapted to burn acetylene gas satisfactorily.

At this writing we may be permitted to claim that we have had experience, failures, and ultimate success. We are glad to say that we have so far perfected a device for burning acetylene gas that we are confident that, when it has been tested on its merit, it will meet with approval.

The Development of Heating Burner.—Our first experiments were with the Bunsen burner principle and construction, a flat, circular burner, with fine wire gauze, with requisite air mixer, and while with the burner thus constructed we could obtain the yellowish blue flame, the consumption of gas, as well as heat produced, was limited to a small amount. The burner became carbonized and required frequent cleaning.

The slightest breath of air extinguished the flame, and the odor was disagreeable. We very early discarded this form of burner as impracticable. The burner we have produced is constructed of perforated steel, with outer and inner walls with coarser perforations on inner than an outer wall, and intended to supply the top of the burner only.

At the bottom of the cylinder there is a concave surface or distributer. There is a mixing chamber, a draft stack and a feed tip, the latter so located in the draft stack as to partially mix the gas with air before reaching the burner. The secret of perfect combustion of acetylene gas consists in adding the proper proportion of air before reaching the burner.

By increasing the burner surface and supplying sufficient gas, properly mixed with air, almost any degree of heat desired may be obtained up to a certain limit. By following this rule a burner can be had that will consume all the way from 1-foot up to 10 feet per hour. Our standard size will consume about 3½ feet per hour. What is desired is the greatest amount of heat from the least amount of gas. This we believe is secured with our burner. The feed tip is so constructed that the gas enters the mixing chamber through 12 jets pointing in different directions and giving the air and gas a rotary motion, which insures a perfect admixture, that burns with a blue flame. Theoretically, the proportion of mixture is about 10 per cent. gas.

To Avoid Lighting Back.—Acetylene gas is rich in carbon, 93 per cent. carbon and 7 per cent. hydrogen. Acetylene gas contains about double the heat units contained in city gas, hence the small volume of gas per hour as compared with the city gas. The igniting point of acetylene gas is about 500° C., which is a lower igniting point than any other gas.

Experiments have shown that acetylene gas will ignite from a red hot wire; so, too, it will ignite in the burner if it is allowed to be heated to that point. It is therefore necessary to limit the heat produced to below that point. This is one of the causes of flashing back that has been such a troublesome feature in obtaining a practicable burner.

Our feed valve is so adjusted that the supply of gas to the burner is below this igniting point. In other words, if directions are followed there will be no flashing back with the Alpha cooker. Should this occur there is no report, no smoke or soot, no carbonizing or clogging of the burner, for the reason that the supply of gas in the draft stack is fed through a regular 6-flame lighting burner, so that, in case the burner should become red hot and ignite the gas in the draft stack, it simply lights the feed tip, and it can be turned off and lighted again on top.

We wish to call attention to the fact that the pressure required for our stoves is the same as for lighting, and is of sufficient range to be adapted to all generators. We build all our stoves high, for the purpose of obtaining sufficient draft; the better the draft the better the operation.

With pure acetylene gas there is practically no odor in its combustion. When certain styles of generators are adopted there will be no complaints on this score.

Demand.—Since placing our stove on the market we have had thousands of inquiries, and these inquiries come largely from consumers who are anxious to utilize acetylene gas for cooking, especially in summer, when the wood or coal fire is objectionable on account of the heat. The

introduction of acetylene gas for cooking purpose depends largely on the generator dealer and agent. If he is prepared to give an intelligent opinion as to the merits of the stoves on the market, and advise his customers accordingly, he will find a more ready sale of generators.

Perhaps few generator makers, or their agents, realize fully the advantage of being able to place a stove with a generator—very often the stove sells the generator. Not only that, but if acetylene is used for cooking, a generator of double the capacity is required than for lighting alone.

This means larger commissions to agents in addition to the commission on the stoves. Every generator manufacturer should have an acetylene stove in his office or factory where he can demonstrate to a customer the utility and practicability of acetylene gas for cooking purposes.

The use of acetylene gas for lighting or cooking has been, is now, and will continue to be a matter of education, and agents must be the educators.

Recently we have added a water back to our stove, which is heated by a coil placed around the perpendicular portion of the burner. This easily heats a pailful of water, while the same burner is used for cooking a meal. With our 2-burner stove, fitted with coils, sufficient water can be heated for a bath as well as heating the bath room in a short time.

The range of application of the Alpha stove is practically the same as any other gas or gasoline stove. It is adapted to all kinds of cooking and baking. At my home we have baked bread in from 35 to 40 minutes, and biscuits in 10 minutes. The baking is especially satisfactory. It is suitable for tea and coffee urns, laundry, laboratory and dental work.

Dentists in small towns, where other gas is not obtainable, will find the heat sufficient to melt babbitt metal, zinc and such materials as they use for molds, vulcanizing, etc. We have adopted a burner of medium capacity, but, if more heat is required, special burners can be furnished to order.

Incandescent Lamp Economy.

At the Sheboygan (Wis.) meeting of the Northwestern Electrical Association Mr. Guy V. Williams read a very interesting paper on the the topic named in the heading, in the course of which he said:

During the past few years there has been but little choice in incandescent lamps in so far as initial claimed efficiency is concerned; 3.1, 3.5 and 4-watt lamps are offered; one chooses what appears best adapted for present needs, and takes what he gets.

An incandescent lamp is too often valued according to the number of lamp hours derived therefrom regardless of initial uniformity of candle power, current consumption and candle hours. Most of the prominent lamp makers may be depended upon to furnish initially satisfactory lamps, yet many lamps find their way to the market lacking in even this essential. A series of recent tests are presented to illustrate this.

Selected at random from a lot of 16-candle power 110-volt, 3.1-watt lamps and tested at their rated voltage:

17.0-candle power	50.0	watts.
20.0 "	55.0	"
15.1 "	50.2	"
17.9 "	72.1	"
15.5 "	60.6	"

Average, 17.1-candle power, 57.58 watts, 3.37 watts per cent.

Selected at random from a lot of 16-candle power, 110-volt, 3.5 watt lamps, tested at rated voltage:

17.25-candle power	71.8	watts.
17.25 "	62.8	"
15.27 "	67.7	"
17.00 "	68.2	"
17.00 "	67.1	"
17.5 "	73.7	"

Average, 16.88-candle power, 70 watts, 4.1 watts per cent.

The conditions shown by the above tests are not frequently met with now, another method having been adopted to secure the same results, as shown in a test lot selected at random from a lot of 16-candle power 111-volt, 3.1 watt lamps.

14.6-candle power	49.0	watts.
12.5 "	49.5	"
14.5 "	49.0	"
14.65 "	49.8	"

Average, 14.06-candle power, 49.33 watts, 3.5 watts per cent.

From a lot of 16-candle power, 105-volt, 3.5-watt lamps:

11.25-candle power	58	watts.
11.00 "	50	"
10.25 "	54	"

Average, 10.8-candle power, 55.3 watts, 5.1 watts per cent.

It will be noted that the total watts consumed by these lamps would not be excessive were they of full candle power, but it is excessive for the amount of light actually delivered. A watt meter would not detect this fault in the third and fourth lots, but would in the first and second.

It is not meant to convey the impression that all lamp makers impose upon their customers in this manner, yet it is done more frequently than is generally believed. The only sure check is for every company to equip itself with a first-class lamp testing outfit. It is not expensive and is really a necessity.

A standard portable voltmeter and an ammeter or wattmeter should be possessed by electrical station. The photometer can be had at an exceedingly low price, so cheap, in fact, that no company can afford to be without one. The immediate result of persistently photometering all lamps is shown in a test selected at random from a lot of 16-candle power 110-volt, 3.1-watt lamps:

15.75-candle power	49	watts.
16.4 "	48	"
16.5 "	48	"
16.25 "	49	"
16.75 "	50	"

Average, 16.33-candle power, 49.8 watts, 3.05 watts per cent.

From the statement made with reference to the initial efficiency of lamps it might appear that no advance has been made in the art of lamp making, but in fact there have been great improvements. The lamp of to-day has a better candle power curve and is more uniform and when operated under similar conditions will give much better service than its predecessor.

It is unreasonable to expect the best results from lamps operated on a fluctuating voltage, particularly if the fluctuations carry the voltage above normal. They will doubtless stand 2 or 3 per cent. increase, but the result will be shorter life and fewer candle hours. The following table shows the effect of increased voltage upon the candle power total watts, watts per candle and life of the 3.5-watt lamp:

Per Cent. Voltage.	Candle Power.	Watts.	Watts Per Cent.	Per Cent. Life.
100	16.	56.	3.5	100.
101	17.	57.2	3.37	81.5
102	17.9	58.4	3.26	67.8
103	19.	59.6	3.14	65.6
104	19.9	60.9	3.06	48.2
105	21.	62.2	2.96	40.2
106	21.8	63.5	2.9	30.

As to the loss of candle power of lamps burnt above normal, the contrast between a new lamp and one that has burnt a few hundred hours is very slight when operated at normal, but becomes more marked as the voltage increases. Increasing the voltage to give a good light itself defeats the end most desired. Though the lamp will burn brighter at first, after a short while the candle power curve shows a marked decline and soon falls below that of a normally operated lamp, so that during the latter part of the life it is really dimmer.

It is also erroneous to assume that a lamp burnt on a fluctuating voltage will give the best results, even though the average of the voltage is the same as the normal voltage of the lamp. As is well known, all lamps gradually lose their brilliancy almost from the moment they are put into service. A lamp's value is determined by its watts per candle power and candle hour area, or, in other words, by the amount of light derived from the current consumed.

The current consumed by a lamp during its life is worth ten-fold more than the lamp itself. It is estimated that the cost of free renewals will not exceed 15 per cent. of the total expenses, so we may assume the 85 per cent. representing fuel, labor and maintenance is the cost of the electric current, all of which is consumed in the lamps for the produc-

tion of light. Is it not of importance, then, to know what is received for the greater part of the expense account? For the use of a photometer it is essential and should be a part of the regular work of every station. Unfortunately is it not, and inconsistent as it may seem, there are those who doubt the reliability of the photometer, while insisting strenuously that they want correctly rated lamps.

It is argued that the personal equation enters into the work with a photometer to such an extent as to render it almost impossible for two workers to agree, and that under the very best of conditions only approximate results can be obtained, consequently there is little satisfaction in working under the conditions ordinarily prevailing in a central station.

Further, that as a number of factories furnish satisfactory lamps without being checked up, they will continue taking their chances, particularly as their employees are usually busy on other work which appears to yield a better and more immediate return.

Admitting that absolutely exact work cannot be done, we know that the photometer is exceedingly reliable and by using an incandescent lamp for a working standard and exercising proper care the percentage of error will be negligible, especially where comparative tests only are made.

That it is impossible to secure ideal conditions for testing lamps in the ordinary central station is also admitted. If the refinements of a lamp are to be brought out it is better to have the work done in a laboratory equipped for the purpose, but ordinarily it is more important to learn what results are being secured under the prevailing conditions. This will show what the customers are actually getting.

If the test shows the lamps to be unsatisfactory the trouble may be looked for in the voltage regulation, in the lamps or in both. In testing not only should different makes and types be tested, but also lamps of different voltages and efficiencies. It is frequently more desirable to make the lamp fit the voltage than to change existing voltage conditions.

Particularly is this so if the voltage has been carried above normal, because, were it reduced the old lamps on the circuit would burn so dim as to make it necessary to replace them. Therefore it is better to determine just what lamps are best suited for the service and adopt them.

By exercising great care in making these tests it will be possible in many instances to find 3.1 watt lamps so satisfactory that their use would be warranted.

The useful life of a lamp is determined by the number of hours it burns before losing 20 per cent. of its rated initial candle power. A simple method for determining the candle hour area is to multiply the average candle power by the number of hours in its useful life.

Until quite recently the highest efficiency offered in 220-volt lamps was 4 watts per candle power, but now an exceedingly satisfactory 3.7-watt lamp is offered and recommended for general use. The filament of this lamp is unanchored. The useful life is about 650 hours and the area about 10,000 candle hours.

There is not nearly as much trouble in systematic lamp testing as is generally supposed. For a medium or small station an average of 30 minutes per day or 3 hours per week will usually suffice. If 10 per cent. of the lamps received are measured initially, a criterion of the entire lot is secured. If they are accepted, one lamp from each barrel should be placed in life test and another, as nearly as possible the same initially, preserved against the accidental breakage of the test lamp, when the test may be started again with this second lamp. The readings may be taken after every 100 hours burning, the candle power curve plotted and the area calculated.

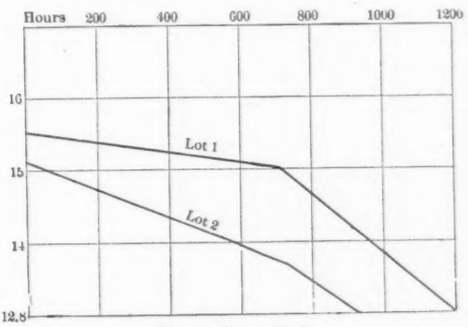
A suitable test rack may be placed at some convenient point where it is possible to keep an accurate account of the hours of burning. As the object is to learn the area or candle power hours delivered to the customers it is neither necessary nor desirable to make an effort to deliver a more uniform voltage to the test lamps than to those in regular service,

This will place the lamp maker in a position to compete on the basis of the merit of his lamps and an incentive is offered for greater effort on his part to improve the quality thereof. There is no reason why lamps should not be bought on the basis of their true worth rather than as simply so many glass bulbs, brass bases and filaments.

A series of tests made by a large central station on five makes of lamps is presented to illustrate the value of making tests as above outlined. Each lot consisted of 10 lamps. Lot 1 gave the best results and was used as a standard for comparison. The lamps tested were 111-volt, 3.1-watt. The comparative value of the lamps is as follows:

Lot 1.	Average area,	8,200.0	candle hours,	or	100.0	per cent.	
" 2.	"	"	4,032.0	"	"	"	49.2 "
" 3.	"	"	3,927.9	"	"	"	47.9 "
" 4.	"	"	2,522.2	"	"	"	30.8 "
" 5.	"	"	615.7	"	"	"	7.5 "

The comparative value of the lamps is proportional to their candle power area. The accompanying illustration gives the curves of one test, in which the candle power area of Lot 2 is 62.9 per cent. of Lot 1.



Curves of Lamp Test.

Taking Lot 1 as the standard for comparison, Lot 2 having an area of 49.2 per cent. as much, the lamps are worth just 49.2 per cent. of those in Lot 1. On this same basis the value of each of the other competing lots may be determined.

With this in view it would appear that the photometer is really quite valuable when properly used and the benefits to be derived therefrom are greater than can be derived from any other source for the same outlay.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Albert F. Kersting, formerly Assistant Superintendent of the Covington (Ky.) works, has been appointed Superintendent of the works of the Danville (Ky.) Gas Light Company, vice Mr. J. S. Brown, resigned.

The Spokane Falls (Wash.) Gas Light Company has arranged for the installing in its works of an ammonia plant. The contractors are Messrs. N. Ohlant & Co., of San Francisco.

The Common Council, of Boonton, N. J., has granted to Mr. William H. Burn and associates, of Newark, N. J., the right to construct and operate a gas works. The vote was unanimous, and no material change was made in the terms of the ordinance, the main features of which were given in the Journal some weeks ago.

Mr. C. B. Hayward, City Clerk, Dayton, Ky., is responsible for the publication of the following: "Sealed bids for the exclusive franchise of entering in and upon the streets and other public places of the city of Dayton, Ky., to lay, maintain and operate pipes, with the necessary street boxes, valves, cocks and service pipes to property line through and across the streets, avenues, lanes and alleys of said city for the purpose of supplying gas for lighting, heating, fuel and power uses to consumers, in and out of the city of Dayton, for a term of 20 years from the granting of this franchise, upon the conditions set forth in a resolution passed by the Board of Councilmen of said city, and approved by the Mayor on the 1st day of July, 1901, and now on file in the office of the City Clerk, will be received by the City Clerk of said city, on Monday, August 19th, 1901, between the hours of 12 o'clock, noon, and 8 o'clock, P.M."

Dayton is a post town in Campbell county, Ky., and is situated, for every practical purpose, on the Ohio river, at a point 1½ miles by rail west of Newport, Ky. It is something less than 2 miles east of Cincinnati. It is quite a manufacturing place, the nature of the products being quite diversified, as may be understood easily when it is told that whiskies, rope, shoes and cigars are there turned out on the large scale. The population of the place is not far from 7,000. Why the authorities should advertise for bidders on the named account is in the nature of a surprise, since it would seem that the one who could, to the exclusion of all others, best undertake the advertised duty, is the concern that supplies gas to Covington and Newport.

MR. WM. HORAN, a faithful, trusted employee of the Peoples Gas Light Company, of Manchester, N. H. (and its predecessor), since 1871, died at his home in Manchester the morning of June 30th.

WE understand that the proprietors of the Orange County Gas and Electric Company, of Middletown, N. Y., have purchased the gas and electric lighting properties at Port Jervis, N. Y.

THE Jamestown (N. Y.) Gas Company has been formally dissolved, the proceedings therewith having been completed early this month.

MR. S. J. FRANKLIN has resigned the position of Superintendent of the Rome (N. Y.) Gas Light Company.

AS said before in the JOURNAL, the plant of the Rome Company is to be rebuilt under the direction of its new Manager, Mr. J. C. Sloan.

THERE is quite a rivalry for the possession of control in the properties of the Gas and Electric Company of Bergen County, N. J., a change in the ownership of which, through the failure of Messrs. Henry Marquand & Co., of this city, would seem to be inevitable. Certain very important and well-qualified New York investors in gas and electric concerns have been and in fact are now looking over the Bergen county Company's affairs, with a view to purchasing. The plants are physically sound, as to their manufacturing and distributing divisions, and that the increase in output, in both the gas and electric divisions, is really wonderful can be readily shown on an inspection of the Company's books.

AT the annual meeting of the Louisville (Ky.) Gas Company the following Directors were elected: Udolpho Snead, K. W. Smith, D. X. Murphy, John Stites and A. B. Loving. We have not been informed as to the Directors named to serve on the Board by the City Council—the city, through its holdings in the Company, is entitled to name 4 Directors out of the full Board of 9.

THE application of the projectors of theUnion Gas and Water Company, for the right to operate gas and water works in Morgantown, West Va., has been rejected. The main objection to the proposition by the Common Council was the length of the franchise life, which was put at 50 years.

THE proprietors of the New Albany (Ind.) Gas Light and Coke Company aver that there is no foundation for the rumor that its properties have been disposed of to Cincinnati capitalists.

THE American Coke and Gas Company has been incorporated at Trenton, N. J., with a capital of $1,000,000. The nominal backers of the project are Messrs. Paul Sheldon, Robt. Whelan and F. H. Schacht, all of Jersey City, N. J.

A RECENT issue of the Chicago ***Chronicle*** said, referring to the trade of the Peoples Gas Light and Coke Company of that city, that after charging off $584,175 and paying interest on its bonds last year, had $2,201,075, or 7.68 per cent. applicable to dividend payments on its capital stock. It is stated that, up to June 30, 1901, which covers the first half of the Company's fiscal year, the net earnings were slightly in excess of $1,500,000, or approximately 10½ per cent. on its stock. The last half of the year has in the past been the best for earnings, in view whereof it is believed that the showing will be maintained for the year. Activity in new building this summer, and that which will be done in addition next fall, will add largely to earnings. The Company is expanding into new territory on the South Side, and large increases from that source will be shown during the last quarter of this year and the first of next.

A CORRESPONDENT at Mobile, Ala., forwards the following: "The first reduction in the price of gas which is to come to Birmingham, Ala., users thereof will be made within the next 6 months, possibly within 3 months, which reduction will place the price at $1.25 per 1,000 cubic feet. Within 18 months, or 2 years at the most, the price of gas will be reduced to $1 per 1,000 cubic feet. It is rather difficult to estimate the time necessary to make such changes in the plant of the Company as will allow the latter reduction. Numerous changes will be necessary and almost an entirely different equipment will be placed in the plant. Until this equipment is placed it will be impossible to have dollar gas, according to the statements of Mr. Robert Jemison. When seen recently Mr. Jemison talked freely regarding the forthcoming reductions in the price of gas and suggested changes in the plant. He stated that the Company proposed to add to the present plant a considerable amount of modern machinery, and until this machinery is in working order he will be unable to make the promised and marked reductions. 'It is necessary for us to economize,' said Mr. Jemison, 'before we can reduce prices, and we are making every effort to secure this economy so that within a short time we may give the reduction. Within 6 months, and possibly 3 months, we will have placed enough of our new machinery to enable us to offer gas at $1.25 yer 1,000. Then, within 18 months or 2 years we will be able to offer gas at $1 per 1,000. We are as anxious to make the reductions as the people are to secure them, and we will use every effort to arrange for the changes before the limit I now name is nearly expired. Respecting the issuance of transfers on all divisions of the trolley car lines, I can only say that it is our hope to take the people of the city by surprise and grant them transfers within a short time. We certainly will be in a position to do so before the 1st of January, and may do so at almost any day.'"

THE officers of the Lancaster County (Pa.) Railway and Light Company, which is the succeeding corporation to the Lancaster Gas Light and Fuel Company, the Edison Electric Illuminating Company, of Lancaster, and the Conestoga Traction Company, are: Directors, William B. Given, S. R. Shipley, W. W. Griest, P. D. Shaw and L. M. Garrison; President, William B. Given; Secretary and Treasurer, O. M. Hoffman; Manager, Frank S. Given.

A CORRESPONDENT in Sioux City, Ia., forwards the following under date of the 7th inst.: "The consolidation of the Sioux City Gas Light Company and the Sioux City Electric Company was perfected last week. They are succeeded by the Sioux City Gas and Etectric Company, which takes over all the rights and properties of its predecessors. The officers of the new Company are: President, S. T. Bodine; Vice-President, L. L. Kellogg; Secretary and Treasurer, Lewis Lillie; Asst. Treasurer, James Ball; Asst. Secretary, W. R. Goudy. The provisional Board of Directors, to act until the second Monday of February, 1902, comprise Messrs. L. L. Kellogg, F. C. Morgan, W. P. Manley, C. L. Wright and W. R. Goudy.

THE final acts in the transformation and changing over of the properties of the famous (the last word should have a prefix) Equitable Gas Light Company, of San Francisco, are about ready for the stage. For further information and particulars respecting the dropping of the curtain, our readers are respectfully referred to Dr. J. W. Chisholm, Vice-President Equitable Gas Light Company, San Francisco, Cal.

ANOTHER effort is to be made to improve the plant of the Albion (N. Y.) Gas Company. It has never been a very profitable property.

THE authorities of Wauwatosa, Wis., have finally granted a franchise to Mr. E. G. Cowdery and his associates for the supply of gas to that center. Under the agreement the franchise is to run for 50 years, the first 15 years of which is to be exclusive. The Company may not charge to exceed $1.20 per 1,000 cubic feet, and at least 4 miles of mains must be laid in the first year of the life of the franchise. Tke Company is capitalized in $50,000. It is not proposed to construct a works at Wauwatosa, as the supply may be readily piped from the plant of the Milwaukee Company.

AT the annual meeting of the Milwaukee Gas Light Company the reports for the twelvemonth showed a gain in output over the corresponding year amounting to something over 10 per cent. Manager Cowdery outlined in brief the comprehensive scheme of plant betterment underway, and the election for officers resulted as follows: Directors, Emerson McMillin, B. M. Weil, Samuel M. Green, E. G. Cowdery, F. G. Bigelow, A. E. Smith, H. C. Payne, J. P. Murphy and H. A. Snedke—the latter succeeds Mr. Washington Becker, resigned; President, Emerson McMillin; First Vice-President, B. M. Weil; Second Vice-President, S. M. Green; Secretary and Treasurer, S. J. Glass; General Manager, Edward G. Cowdery.

MR. CHARLES E. DOLE is to remain as Superintendent of the Bangor (Me.) Gas Light Company, which property, as was heretofore noted in the JOURNAL, has come into the possession of the American Gas Company.

THE Light Committee of the Richmond (Va.) Municipal Council will, it is hoped, soon see its way clear to making a positively practical move

(*Concluded on page* 95.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

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AGENTS:

New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JULY 15, 1901.

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ment in respect of overhauling the main system of the city gas works. Perhaps the Committee could also be induced to see the necessity of recommending the construction of an additional storage holder.

THE proprietors of the Lebanon (Pa.) Gas Company have declared a semi-annual dividend of 4 per cent. It was made payable the 10th inst. The Company's Secretary and Treasurer, Major J. W. Mish, is busily engaged in overseeing the carrying out of important plant betterments and main extensions.

THE proposed opposition scheme for St. Paul, Minn., does not seem to possess much strength. A butcher (Gen. M. D. Flower) is said to be the meatiest man of the concern.

The Carnegie Technical School.

The Advisory Committee appointed by the Board of Trustees of the Carnegie Institute of Pittsburg, to investigate and prepare a plan for the proposed School of Technology to be presented to the city of Pittsburg by Andrew Carnegie, have handed in a report which advocates the establishment of three grades of schools.

The first will be the Carnegie Technical College, which will provide a technical education to high school graduates, teaching engineering in all its branches.

The second, to be called the Carnegie Technical High School, will be for the benefit of graduates of the grammar schools, and will provide, in addition to the regular high school studies, instruction in blast furnace and foundry practice, brass founding, pattern making, metal working, stationary, locomotive and marine engine and boiler management, gas manufacture, electricity and other departments, more particularly adapted to the needs of the Pittsburg district.

The third school will be the Carnegie Artisan Day and Evening Classes. These classes are intended for the benefit of those who are unable to take advantage of the more complete courses in the technical school.

The Market for Gas Securities.

The expected has happened in the matter of "regular" quotations for Consolidated gas, which sold down to-day (Friday) to well under 212. Not a bit of reason exists for the lowering in values for the week of something like 10 points, but the exigencies of the money market, which in this section of America are largely controlled by the City Bank, the Farmers Loan and Trust Company and 26 Broadway. The three named institutions have each important memberships in the Consolidated Gas Company, and it is a surety that none of their shares in the Consolidated are for sale at current prices. Of course, there is such a thing as "going short," just for a turn. The local lighting situation, in so far as that means supply from central stations, is pretty well mixed up by the warlike attitudes of those in control of the subway construction, the contractors, whereof are paying but scant attention to underground piping that they are uncovering. A week or more of drastic measures on the part of Chief Engineer Bradley's men may, and will, have a salutary effect. Quotations are of the nominal sort. Consolidated opened to-day at 213½ bid and closed at 211½ bid.

Brooklyn Union is returned at 212 to 217, while it should easily be 20 points higher, if worth is considered the basis of prices. Peoples, of Chicago, in spite of its increased business showing for the past half year, is quoted at 112¼ to 112½. Baltimore Consolidated is gaining right along, and our advice is to buy it at the figures reported. More than one strong interest is looking for control in the Gas and Electric Company, of Bergen county, N. J. Those who would know the value of Bay State gas are referred to Mr. J. E. Addicks.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 15.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	212¼	213
Central Union, Bonds, 5's.	3,000,000	1,000	107	108
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	305	311
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	108¾	109¼
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River . Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	108	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	135	..
Preferred	5,000,000	100	158	.
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115	117
Yonkers	299,650	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	212	217
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	⅝	¾
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works.	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	92½	95
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5¾	8
" " Bonds, 5's	5,250,000	1,000	73	76
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	103	103¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	215	216
Consolidated, Baltimore	11,000,000	100	65⅛	65¾
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	11	14
" Con. Mtg. 5's	380,000	1,000	81½	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,825,500	50		89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	35	40
Fort Wayne	2,000,000	..	..	
" Bonds	2,000,000	..	54	58
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	62	68
" Bonds, 6's	2 650,000	..	98	
Jackson Gas Co.	250,000	50	70	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	101½	103
Laclede, St. Louis	10,000,000	100	90	91
Preferred	2,500,000	100	93	101
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	60	66
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	184	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	112¾	112½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	..	.
St. Paul Gas Light Co.	1,500,000	100	50	54
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,465,000	1,000	88	90½
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	85	87
Syracuse, N. Y.	1,750,000	100	16	19
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	295	300
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	93½	95
Wilmington, Del.	600,000	50	200	201

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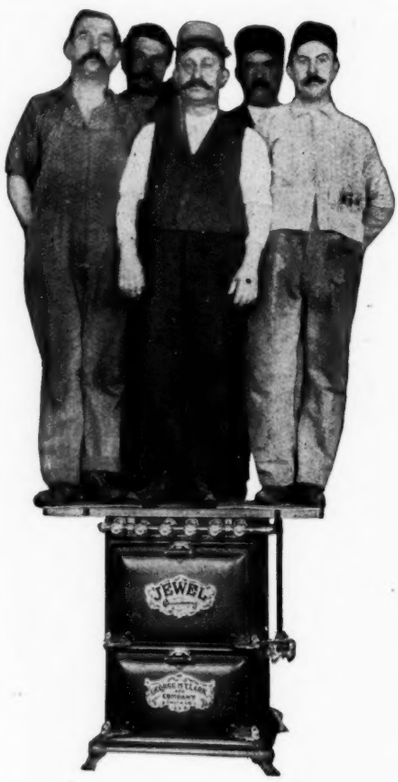

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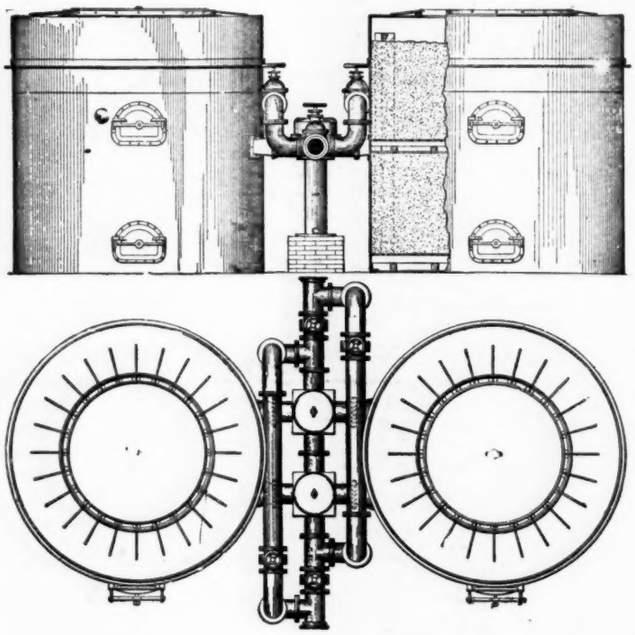

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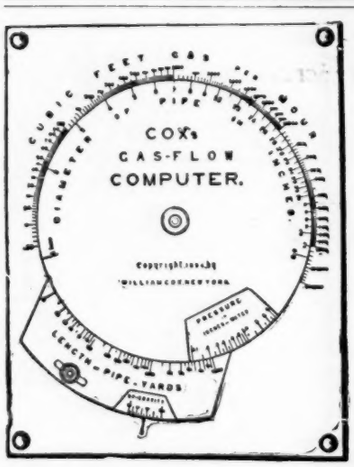

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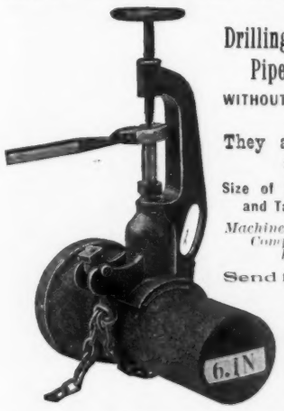

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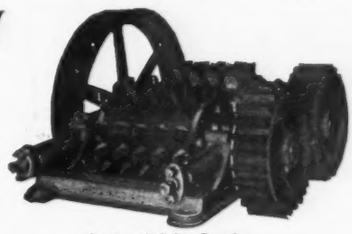

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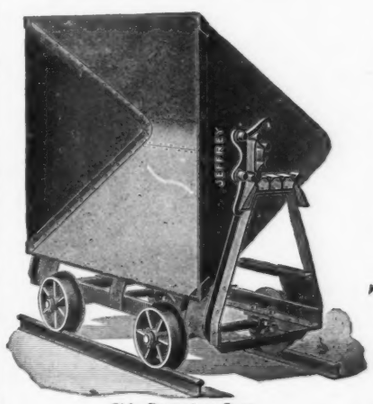

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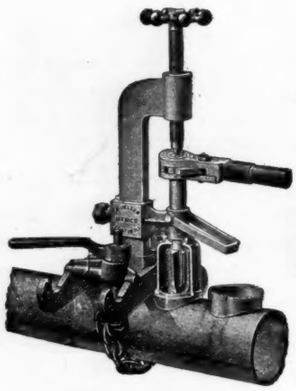

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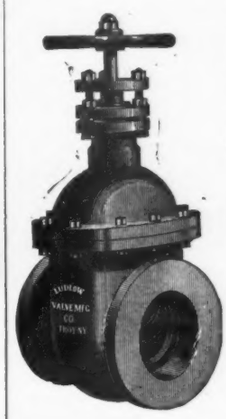

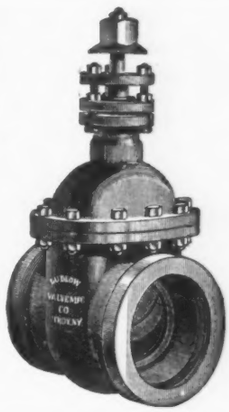

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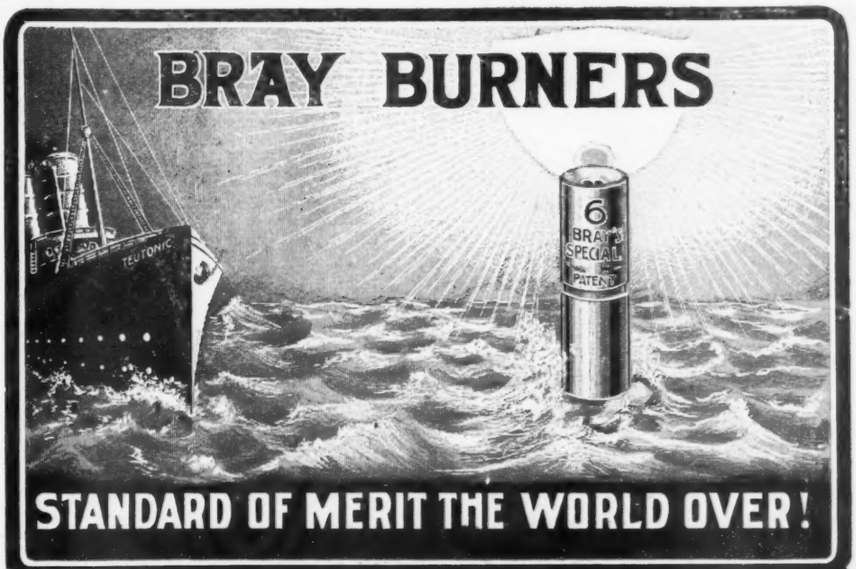

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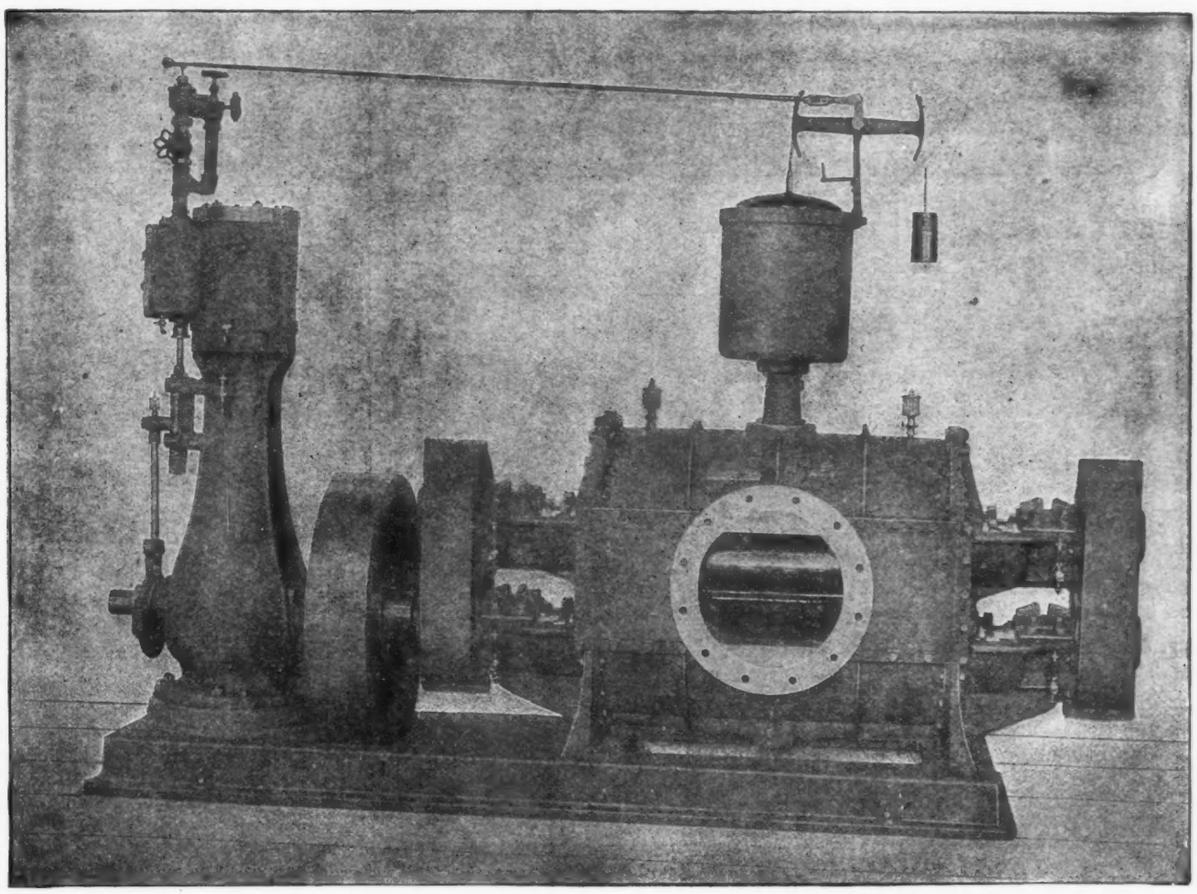

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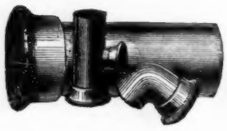

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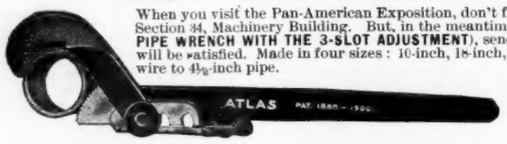

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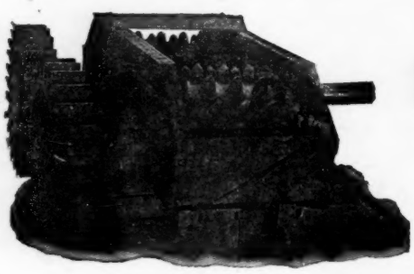

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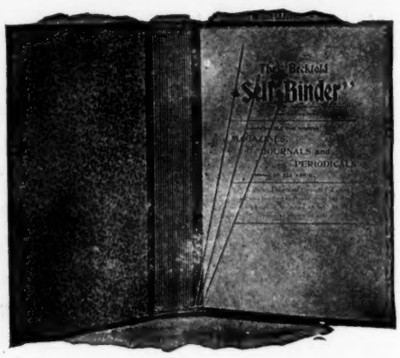

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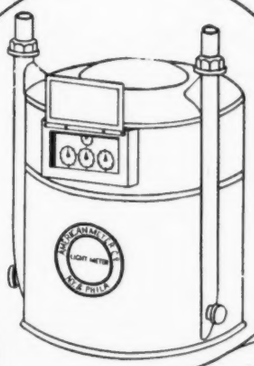

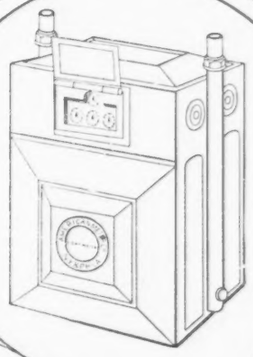

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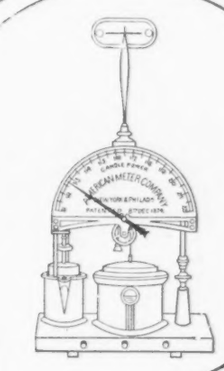
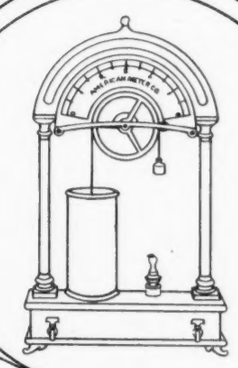
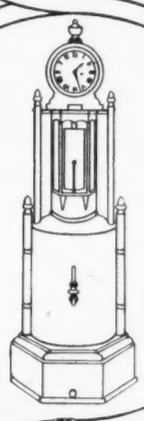
AUGUST, 1901.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Thu.	1	7.40 PM	8.40 PM	7.10	3.30
Fri.	2	7.40	9.20	7.10	3.30
Sat.	3	7.40	9.50	7.10	3.30
Sun.	4	7.40	10.20	7.10	3.30
Mon.	5	7.40	11.00	7.10	3.30
Tue.	6	7.40 LQ	11.40	7.10	3.45
Wed.	7	7.40	12.30 AM	7.10	3.45
Thu.	8	7.40	1.20	7.10	3.45
Fri.	9	7.40	2.10	7.10	3.45
Sat.	10	7.40	4.10	7.10	3.45
Sun.	11	7.30	4.10	7.10	3.45
Mon.	12	7.30	4.10	7.10	3.45
Tue.	13	7.30 NM	4. 0	6.55	4.00
Wed.	14	7.30	4.10	6.55	4.00
Thu.	15	7.30	4.10	6.55	4.00
Fri.	16	7.30	4.10	6.55	4.00
Sat.	17	7.30	4.10	6.55	4.00
Sun.	18	7.50	4.20	6.55	4.00
Mon.	19	8.20	4.20	6.55	4.00
Tue.	20	8.50	4.20	6.45	4.10
Wed.	21	9.30 FQ	4.20	6.45	4.10
Thu.	22	10.10	4.20	6.45	4.10
Fri.	23	11.00	4.20	6.45	4.10
Sat.	24	11.50	4.20	6.45	4.10
Sun.	25	12.50 AM	4.20	6.45	4.10
Mon.	26	2.00	4.20	6.45	4.10
Tue.	27	3.00	4.20	6.30	4.20
Wed.	28	No L.	No L.	6.30	4.20
Thu.	29	No L. FM	No L.	6.30	4.20
Fri.	30	No L.	No L.	6.30	4.20
Sat.	31	7.00 PM	8.20 PM	6.30	4.20

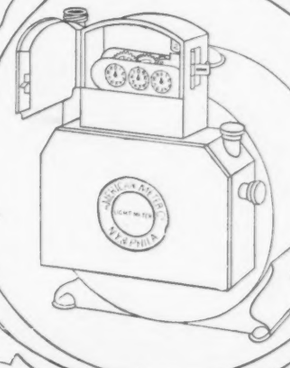


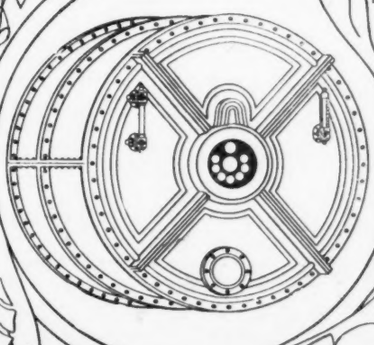




TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45





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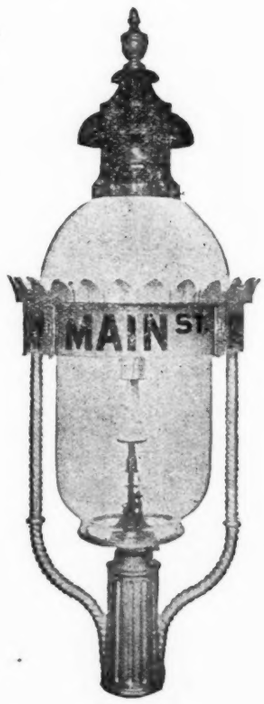

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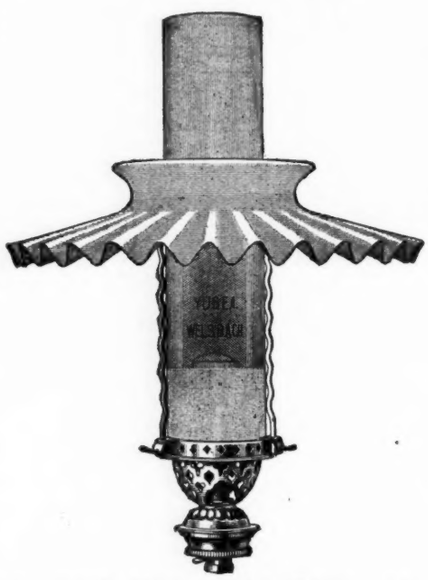

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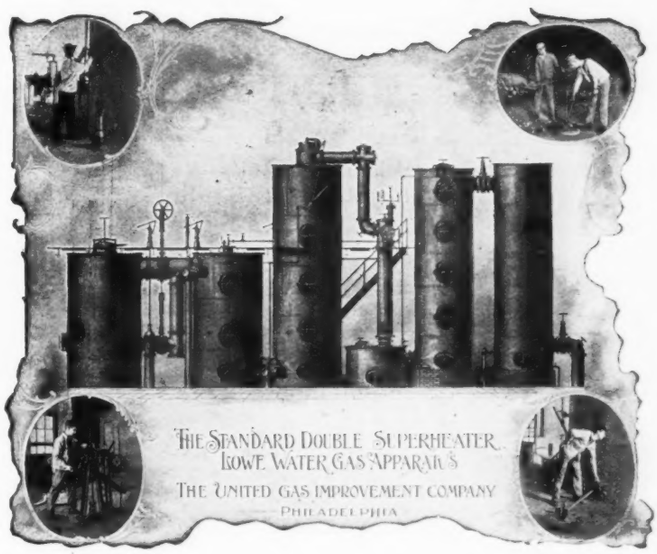
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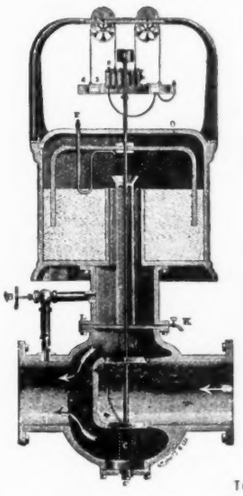

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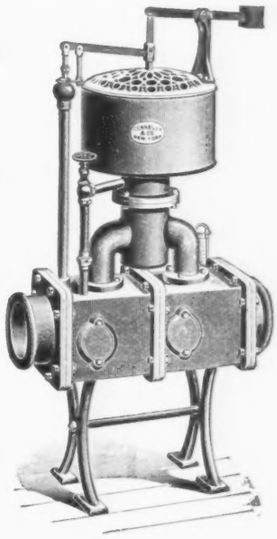

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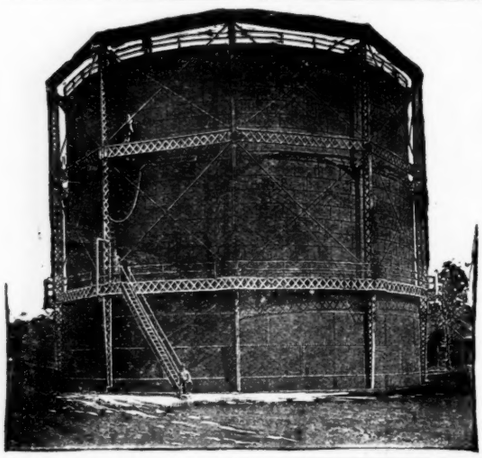

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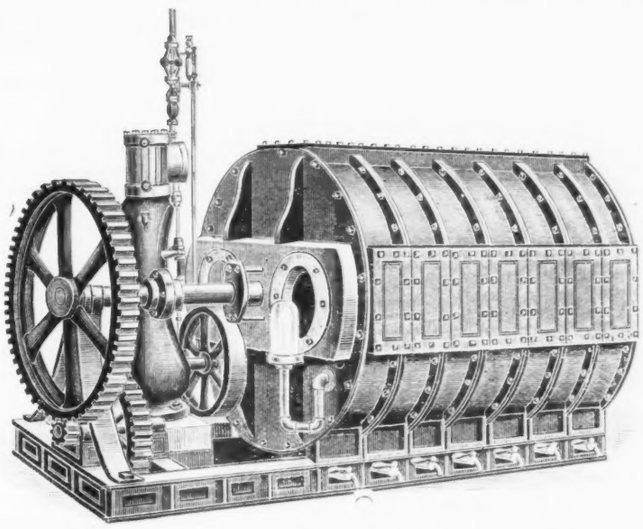

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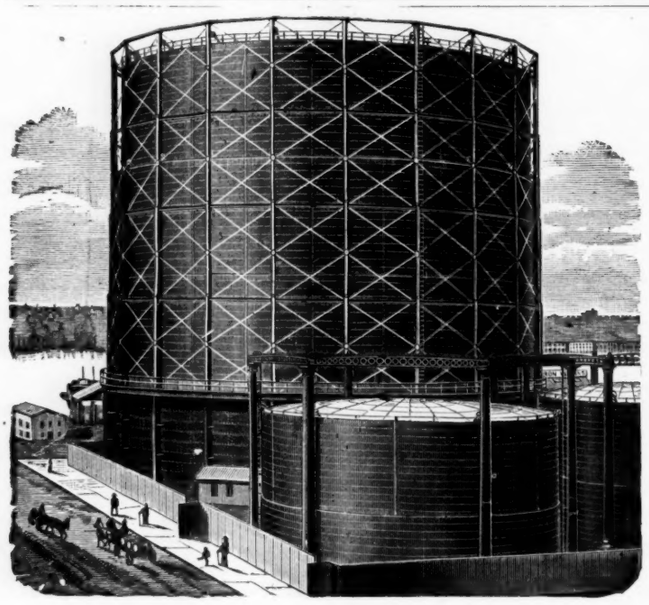

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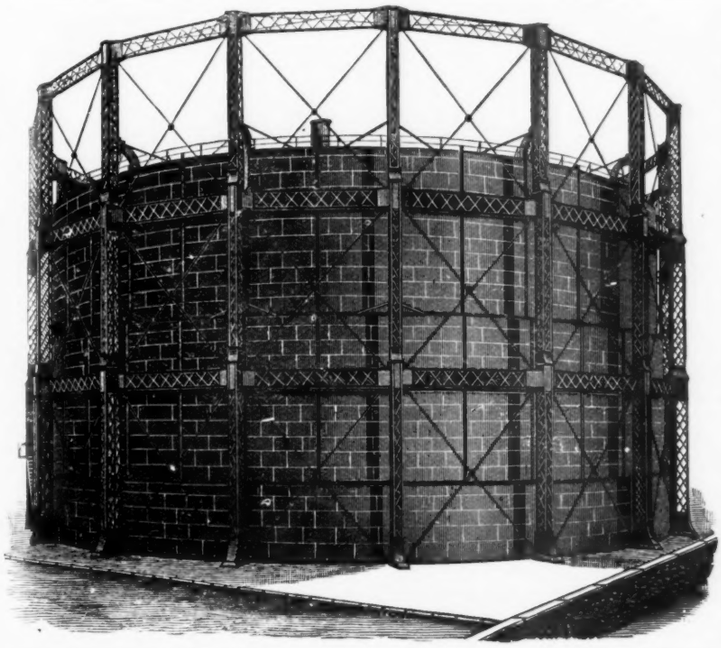

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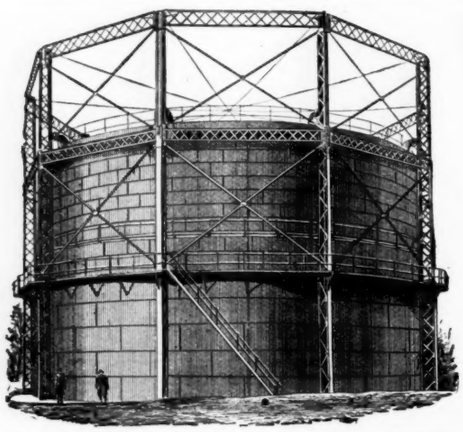

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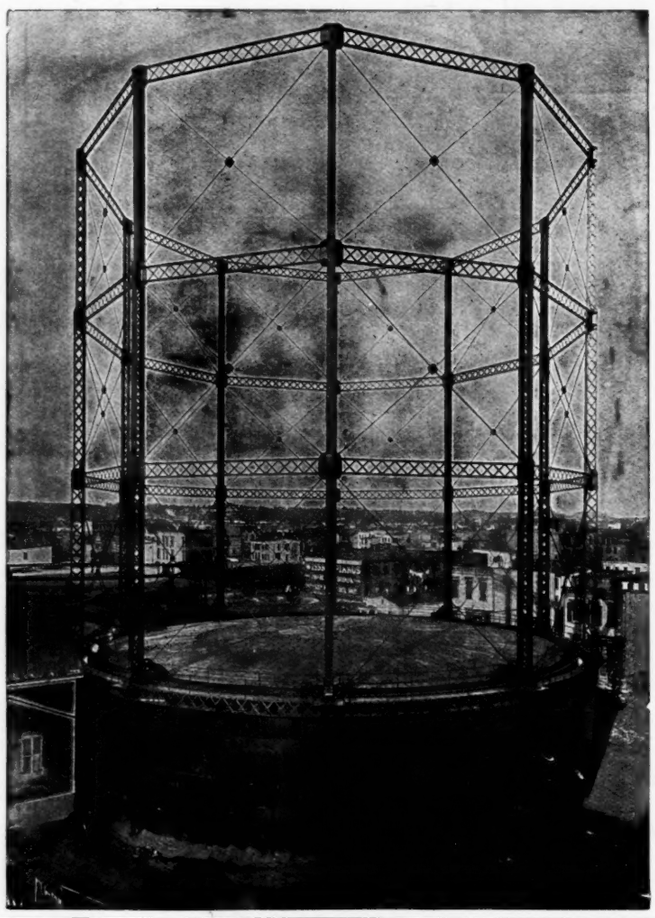

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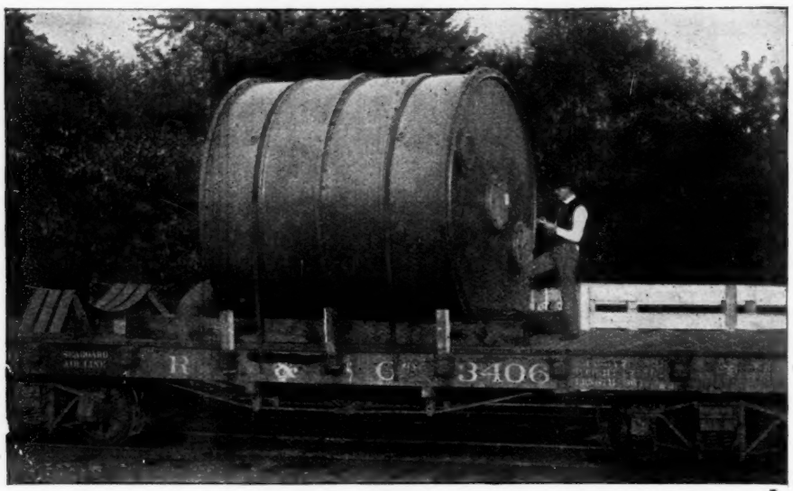

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